HP StorageWorks

Director 2/140 installation guide

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Director 2/140 installation guide

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About this guide

This guide provides information about installing, configuring, managing, and verifying operation of the HP StorageWorks Director 2/140. The director switch connects storage devices, hosts, and servers in a SAN. The director is easily managed and configured to optimize the performance of your SAN.

Intended audience

This guide is intended for trained service and installation representatives experienced with the SAN technology and Fibre Channel technology.

Related documentation

In addition to this guide, please refer to other documents for this product:

For a list of corresponding documentation included with this product, see the Related documents section of the *HP StorageWorks Director 2/140 release notes*.

For the latest information, documentation, and firmware releases, please visit the HP StorageWorks website:

http://h18006.www1.hp.com/storage/saninfrastructure.html

For information about Fibre Channel standards, visit the Fibre Channel Industry Association website http://www.fibrechannel.org

Document conventions and symbols

Table 1 Document conventions

Convention	Element
Medium blue text: Figure 1	Cross-reference links and e-mail addresses
Medium blue, underlined text (http://www.hp.com)	Web site addresses
Bold font	• Key names • Text typed into a GUI element, such as into a box • GUI elements that are clicked or selected, such as menu and list items, buttons, and check boxes
Italics font	Text emphasis
`Monospace font`	• File and directory names • System output • Code • Text typed at the command-line
`Monospace, italic font`	• Code variables • Command-line variables
`Monospace, bold font`	Emphasis of file and directory names, system output, code, and text typed at the command line

⚠ **WARNING!** Indicates that failure to follow directions could result in bodily harm or death.

△ **CAUTION:** Indicates that failure to follow directions could result in damage to equipment or data.

IMPORTANT: Provides clarifying information or specific instructions.

NOTE: Provides additional information.

TIP: Provides helpful hints and shortcuts.

Rack stability

⚠ **WARNING!** To reduce the risk of personal injury or damage to equipment:

- Extend leveling jacks to the floor.
- Ensure that the full weight of the rack rests on the leveling jacks.
- Install stabilizing feet on the rack.
- In multiple-rack installations, secure racks together.
- Extend only one rack component at a time. Racks may become unstable if more than one component is extended.

HP technical support

Telephone numbers for worldwide technical support are listed on the HP support web site: http://www.hp.com/support/

Collect the following information before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

HP strongly recommends that customers sign up online using the Subscriber's choice web site: http://www.hp.com/go/e-updates

- Subscribing to this service provides you with e-mail updates on the latest product enhancements, newest versions of drivers, and firmware documentation updates as well as instant access to numerous other product resources.
- After signing up, you can quickly locate your products by selecting **Business support** and then **Storage** under Product Category.

HP-authorized reseller

For the name of your nearest HP-authorized reseller:

- In the United States, call 1-800-345-1518.
- Elsewhere, visit this HP web site: http://www.hp.com. Then click **Contact HP** to find locations and telephone numbers.

Helpful web sites

For third-party product information, see the following HP web sites:

- http://www.hp.com
- http://www.hp.com/go/storage
- http://www.hp.com/support/
- http://www.docs.hp.com

1 Overview

This chapter contains the following HP StorageWorks Director 2/140 information:

- Director description, page 13
- Features, page 13
- Hardware components, page 17
- Tools and test equipment, page 22
- Optional kits, page 24

Director description

The director is a second-generation, 140-port product that provides dynamic switched connections between Fibre Channel servers and devices in a SAN environment. Directors are managed and controlled through an High Availability Fabric Manager (HAFM) appliance with HAFM and Director 2/140 Element Manager installed. The HAFM appliance is a 1U rack-mount appliance that provides a central point of control for up to 48 directors and/or edge switches.

Multiple directors and the HAFM appliance communicate through the customer's local area network (LAN).

Features

Features of the Director 2/140 include:

- Scalable from 32 to 140 user ports
- 100% dynamic non-blocking, cut through switching with congestion queuing
- Online error detection, error isolation, and error recovery
- Redundant, hot-pluggable components
- Full duplex 200 MB/sec per port performance
- Less than 2-μs average switch latency
- 100-km distance support (60 buffers), with use of repeaters
- Small form factor, hot-pluggable optical transceivers, auto configure G_ports
- Combination short-wave or long-wave laser transceivers
- Redundant power supplies and fan modules
- Online product repair for Field Replaceable Units (FRUs)
- Periodic health check and enhanced system monitoring
- Non-disruptive firmware load and update

Director management

The director is managed and controlled through:

- The HAFM application. This graphical user interface (GUI) resides on the HAFM appliance and provides a single point of management for all directors, and a launching point for the Director 2/140 Element Manager.
- Simple network management protocol (SNMP). A SNMP agent is implemented through the HAFM application that allows administrators on SNMP management workstations to access director management information using any standard network management tool. Administrators can assign internet protocol (IP) addresses and corresponding community names for up to 12 SNMP workstations functioning as SNMP trap message recipients. Refer to the *HP StorageWorks SNMP reference guide for directors and edge switches* for more information.
- The Internet using the Embedded Web Server (EWS) interface installed on the director. This interface supports configuration, statistics monitoring, and basic operation of the director, but does not offer all the capabilities of the Director 2/140 Element Manager. Administrators launch the EWS interface from a remote PC by entering the director's IP address as the internet URL, then entering a user name and password at a login screen. The PC browser then becomes a management console.

NOTE: The default user name for the right to view status and other information is *operator*. The default user name for the right to modify configuration data, perform maintenance tasks, or perform other options is *Administrator*. The default password for both user names is *password*.

- The command line interface (CLI). The CLI allows you to access many HAFM and Element Manager functions while entering commands during a telnet session with the director. The primary purpose of the CLI is to automate management of a large number of directors using scripts. The CLI is not an interactive interface; no checking is done for pre-existing conditions and no prompts display to guide users through tasks. Refer to the *HP StorageWorks CLI reference guide for directors and edge switches* for more information.
- A customer-supplied PC or UNIX-based platform with the HAFM appliance and client HAFM and Director Element Manager installed.
- A customer-supplied remote workstation communicating with the HAFM appliance through a corporate intranet.
- A customer-supplied PC platform with a network connection to the EWS interface installed on the director.
- A customer-supplied server platform communicating with the switch through a LAN or corporate intranet. The HAFM applications are ordered and installed on the server by the customer.

Error-detection, reporting, and serviceability

The director provides the following error-detection, reporting, and serviceability features:

- Light-emitting diodes (LEDs) on director FRUs and the front bezel that provide visual indicators of hardware status or malfunctions.
- System and threshold alerts, event logs, audit logs, link incident logs, threshold alert logs, and hardware logs that display director, Ethernet link, and Fibre Channel link status at the HAFM appliance, remote workstation, or EWS.

- Diagnostic software that performs power-on self-tests (POSTs) and port diagnostics (internal loopback, external loopback, and Fibre Channel (FC) wrap tests). The FC wrap test applies only when the director is configured to operate in FICON management style.
- An internal modem for use by support personnel to dial in to the HAFM appliance for event notification and to perform remote diagnostics.
- Automatic notification of significant system events (to support personnel or administrators) through e-mail messages or the call-home feature at the HAFM appliance.

NOTE: The call-home feature is not available through the EWS interface.

- An RS-232 maintenance port at the rear of the director (port access is password-protected) that enables installation or service personnel to change the director's internet protocol (IP) address, subnet mask, and gateway address.
- Redundant FRUs—logic cards, power supplies, and cooling fans—that are removed or replaced without disrupting director or Fibre Channel link operation.
- A modular design that enables quick removal and replacement of FRUs without tools or equipment.
- Concurrent port maintenance—UPM cards are added or replaced and fiber-optic cables are attached to ports without interrupting other ports or director operation.
- Beaconing to assist service personnel in locating a specific port, FRU, or director in a multi-switch environment. When port beaconing is enabled, the amber LED associated with the port flashes. When FRU beaconing is enabled, the amber (service required) LED on the FRU flashes. When unit beaconing is enabled, the system error indicator on the front bezel flashes. Beaconing does not affect port, FRU, or director operation.
- Data collection through the Element Manager on the HAFM appliance to help isolate system problems. The data includes a memory dump file and audit, hardware, and engineering logs.
- Status monitoring of redundant FRUs and alternate Fibre Channel data paths to ensure continued director availability in case of failover. The HAFM application queries the status of each backup FRU daily. A backup FRU failure is indicated by an illuminated amber LED.
- SNMP management using the Fibre Alliance management information base (MIB) 3.1, that runs on the HAFM appliance. Up to 12 authorized management workstations can be configured through the HAFM application to receive unsolicited SNMP trap messages. The trap messages indicate operational state changes and failure conditions.
- SNMP management using the Fibre Channel Fabric Element MIB 1.1, transmission control protocol/internet protocol (TCP/IP) MIB-II definition (RFC 1213), or a product-specific MIB that runs on each director. Up to six authorized management workstations can be configured through the Element Manager on the HAFM appliance to receive unsolicited SNMP trap messages. The trap messages indicate operational state changes and failure conditions.

NOTE: For more information about SNMP support provided by HP products, refer to the *HP StorageWorks SNMP reference guide for directors and edge switches*.

Zoning

The director supports a name server zoning feature that partitions attached devices into restricted-access groups called zones. Devices in the same zone can recognize and communicate with each other through switched port-to-port connections. Devices in separate zones cannot communicate with each other.

Zoning is configured by authorizing or restricting access to name server information associated with device N_Ports that attach to director fabric ports (F_Ports). A zone member is specified by the port number to which a device is attached, or by the eight-byte (16-digit) World Wide Name (WWN) assigned to the host bus adapter (HBA) or Fibre Channel interface installed in a device. A device can belong to multiple zones.

△ **CAUTION:** If zoning is implemented by port number, a change to the director fiber-optic cable configuration disrupts zone operation and may incorrectly include or exclude a device from a zone.

If zoning is implemented by WWN, removal and replacement of a device HBA or Fibre Channel interface (thereby changing the device WWN) disrupts zone operation and may incorrectly include or exclude a device from a zone.

In Open Fabric mode, only zoning by WWN is supported. Zoning by port numbers is not supported.

Zones are grouped into zone sets. A zone set is a group of zones that is enabled (activated) or disabled across all directors and edge switches in a multi-switch fabric. Only one zone set can be enabled at one time.

Multi-switch fabrics

A Fibre Channel topology that consists of one or more interconnected directors or switch elements is called a fabric. Operational software provides the ability to interconnect directors (through expansion port (E_Port) connections) to form a multi-switch fabric. The data transmission path through the fabric is typically determined by fabric elements and is user-transparent. Subject to zoning restrictions, devices attached to any interconnected director can communicate with each other through the fabric.

Because a multi-switch fabric is typically complex, maintenance personnel should be aware that several factors can degrade fabric performance or cause connectivity failures. These factors include:

- **Domain ID assignment**—Each director in a fabric is identified by a unique domain ID that ranges from 1 through 31. A domain ID of 0 is invalid. If two operational fabrics join, they determine if any domain ID conflicts exist between the fabrics. If one or more conflicts exist, the E_Ports that form the interswitch link (ISL) segment to prevent the fabrics from joining.
- **Zoning**—In a multi-switch fabric is configured on a fabric-wide basis, and a change to the zoning configuration is applied to all directors and switch elements in the fabric. To ensure zoning is consistent across a fabric, the following rules are enforced when two fabrics (zoned or unzoned) join:

- **Fabric A unzoned and Fabric B unzoned**—The fabrics join successfully, and the resulting fabric remains unzoned.
- **Fabric A zoned and Fabric B unzoned**—The fabrics join successfully, and fabric B automatically inherits the zoning configuration from fabric A.
- **Fabric A unzoned and Fabric B zoned**—The fabrics join successfully, and fabric A automatically inherits the zoning configuration from fabric B.
- **Fabric A zoned and Fabric B zoned**—The fabrics join successfully only if the zone configurations can be merged. If the fabrics cannot join, the connecting E_Ports segment and the fabrics remain independent.

Zone configurations for two fabrics are compatible (the zones can join) if the active zone set name is identical for each fabric, and if zones with the same name have identical elements.

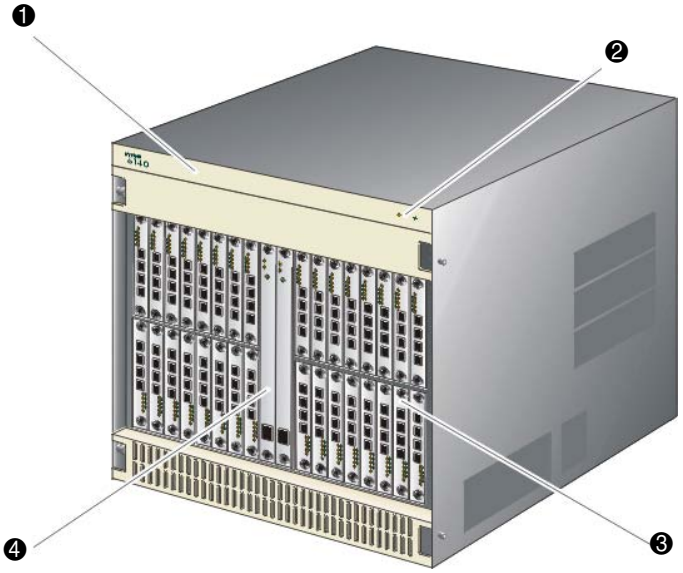
- **Port segmentation**—When an ISL activates, directors exchange operating parameters to determine if they are compatible and can join to form a single fabric. If they are incompatible, the connecting E_Port at each director segments to prevent the creation of a single fabric. A segmented link transmits only Class F traffic; the link does not transmit Class 2 or Class 3 traffic. The following conditions cause ports to segment:
  - **Incompatible operating parameters**—Either the resource allocation timeout value (R_A_TOV) or error detect timeout value (E_D_TOV) is inconsistent between directors. To prevent E_Port segmentation, the same E_D_TOV and R_A_TOV must be specified for each director.
  - **Duplicate domain IDs**—One or more domain ID conflicts are detected.
  - **Incompatible zoning configurations**—Zoning configurations for the directors are not compatible.
  - **Build fabric protocol error**—A protocol error is detected during the process of forming the fabric.
  - **No principal switch**—No director in the fabric is capable of becoming the principal switch.
  - **No response from attached switch**—After a fabric is created, each director in the fabric periodically verifies operation of all attached switches and directors. An ISL segments if a switch or director does not respond to a verification request.
  - **ELP retransmission failure timeout**—A director that exhibits a hardware failure or connectivity problem cannot transmit or receive Class F frames. The director did not receive a response to multiple exchange link protocol (ELP) frames, did not receive a fabric login (FLOGI) frame, and cannot join an operational fabric.

Hardware components

The director provides a modular design that enables quick removal and replacement of FRUs. The following sections define Director 2/140 main components.

Front view

Figure 1 shows Director 2/140 components accessible from the front of the director. Component descriptions follow the figure.



1 Front bezel
2 Power and system error LEDs
3 UPM cards (32)
4 CTP cards

Figure 1 Director components—front

CTP card

The Director 2/140 ships with two Control Processor (CTP) cards. The active CTP card initializes and configures the director after power on, and contains the microprocessor and associated logic that coordinate director operation. The second CTP card serves as a backup. A CTP card provides an Initial Machine Load (IML) button on the faceplate. When the button is pressed and held for three seconds, the director reloads firmware and resets the CTP card without switching off power or affecting operational fiber-optic links.

Each CTP card also provides a 10/100 megabit per second (Mbps) RJ-45 twisted pair connector on the faceplate that attaches to an Ethernet Local Area Network (LAN).

Each CTP card provides System Services Processor (SSP) and Embedded Port (EP) subsystems. The SSP subsystem runs director applications, communicates with director ports, and controls the RS-232 maintenance port and 10/100 Mbps ethernet port. The EP subsystem provides Class F processing, and manages frame transmission to and from the Serial Crossbar Assembly (SBAR). In addition, CTP cards provide non-volatile memory for storing firmware director configuration information, persistent operating parameters, and memory dump files. Director firmware is upgraded concurrently (without disrupting operation).

Each card faceplate contains a green light emitting diode (LED) that turns ON if the card is operational and active, and an amber LED that turns ON if the card fails. The LEDs are OFF on the backup CTP. The amber LED FLASHES if beaconing is enabled.

Power/system LED assembly

The bezel at the top front of the director includes an amber system error light-emitting diode (LED) and a green power LED. These LEDs are actuated and controlled by a Power/system LED assembly which is accessed from the rear of the director.

The power LED illuminates when the director is powered on and operational. If the LED extinguishes, a facility power source, alternating current (AC) power cord, or director power distribution failure is indicated.

The system error LED illuminates when the director detects an event requiring immediate operator attention, such as a FRU failure. The LED remains illuminated as long as an event is active. The LED extinguishes when the Clear System Error Light function is selected from the Element Manager application. The LED blinks if unit beaconing is enabled. An illuminated system error LED (indicating a failure) takes precedence over unit beaconing.

Power supplies

The Director 2/140 uses redundant, load-sharing power supplies which step down and rectify facility input power to provide 48-VDC power to director FRUs. The power supplies also provide over-voltage and over-current protection. Either power supply can be replaced while the switch is powered on and operational. Each power supply has a separate backplane connection to allow for different AC power sources.

The power supplies are input rated at 180 to 264 VAC. The faceplate of each power supply provides the following status LEDs:

- A green **PWR OK** LED turns ON if the power supply is operational and receiving AC power.
- An amber **FAULT** LED turns ON if the power supply fails.
- An amber **TEMP** LED turns ON if the power supply shuts down due to an over temperature condition.
- An amber **I LIM** LED turns ON if the power supply is overloaded and operating at the current limit (15.6 A).

Power supply requirements are listed in Appendix B.

UPM card

Each Universal Port Module (UPM) card provides four full-duplex generic ports (G_Ports) that transmit or receive data at 1.063 or 2.125 gigabits per second (Gb/s). G_Port functionality depends on the type of cable attachment. UPM cards use Non-Open Fiber Control (NOFC) Class 1 laser transceivers that comply with Section 21 of the Code of Federal Regulations (CFR), Subpart J as of the date of manufacture.

Depending on device connections, G_Ports work as follows:

- If the G_Port is attached to a Fibre Channel device, the port functions as a fabric port (F_Port). An F_Port is the interface on a director that connects to a device N_Port.

- If the G_Port is attached to another director to form an Interswitch Link (ISL), the port functions as an expansion port (E_Port). A multi-switch fabric is formed through multiple directors and ISLs.

Figure 2 shows the faceplate of an UPM.

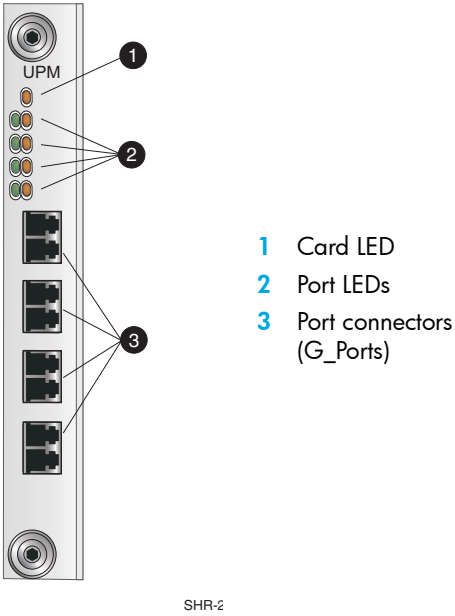


Figure 2 UPM card LEDs and connectors

Single-mode or multi-mode fiber-optic cables attach to UPM cards through small form factor pluggable (SFP) optic transceivers. The fiber-optic transceivers provide duplex connectors, and can be detached from UPM cards (through a 10-pin interface) for easy replacement. Three fiber-optic transceiver types are available:

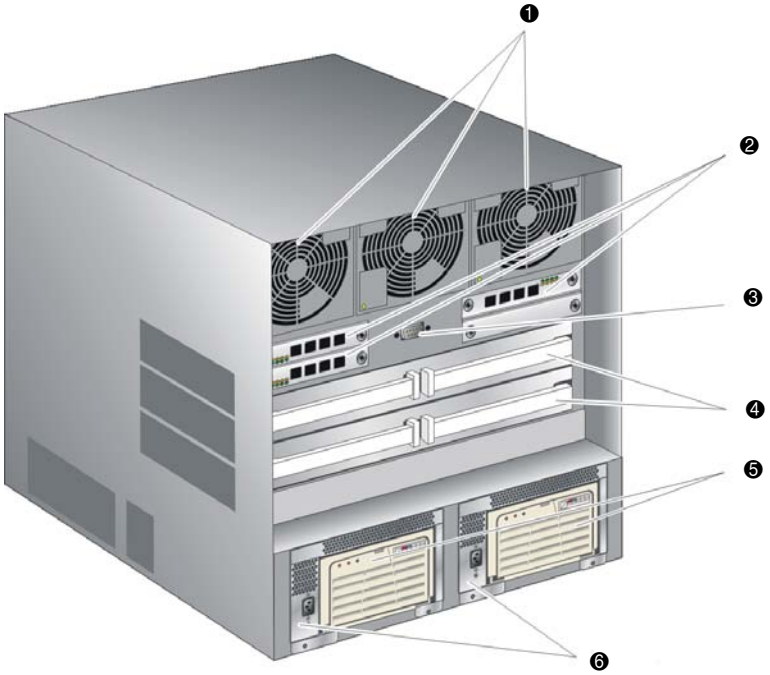
- **Short-wave laser**—Short-wave laser transceivers provide connections for transferring data over short distances (2 to 500 meters) through 50-µm (500 meters) or 62.5-µm (200 meters) multi-mode fiber.

NOTE: HP recommends 50-µm fiber-optic cable for any new installation requiring multi-mode fiber.

- **Long-wave laser**—Long-wave laser transceivers provide connections for transferring data over long distances (up to 10 kilometers) through 9-µm single-mode fiber.
- **Extended reach long-wave laser**—Long-wave laser transceivers that provide connections for transferring data over extended long distances (up to 35 kilometers) through 9-µm single-mode fiber.

Rear view

Figure 3 shows the components accessible from the rear of the Director 2/140 .



1	Fan modules	4	SBAR assemblies
2	UPM cards (3)	5	AC modules
3	Maintenance port	6	Power supplies

Figure 3 Director components—rear

Fan modules

Three fan modules, each containing one system fan (three system fans total), provide cooling for director FRUs, as well as provide redundancy for continued operation if a fan fails.

The fan module can be replaced while the director is powered on and operating, provided the module is replaced within 10 minutes (after which software powers off the director). An amber LED for each fan module turns ON if one or more fans fail or rotate at insufficient velocity.

SBAR assembly

The director ships with two SBAR assemblies. The active SBAR is responsible for Fibre Channel frame transmission from any director port to any other director port. Connections are established without software intervention. The assembly accepts a connection request from a port, determines if a connection can be established, and establishes the connection if the destination port is available. The assembly also stores busy, source connection, and error status for each director port.

The backup SBAR takes over operation if the active assembly fails, and provides the ability to maintain connectivity and data frame transmission without interruption. The transition to the backup assembly is transparent to attached devices.

Each SBAR assembly consists of a card and steel carriage that mounts flush on the backplane. The carriage provides protection for the back of the card, distributes cooling airflow, and assists in aligning the assembly during installation. The rear of the carriage contains a green LED that turns ON if the assembly is operational and active, and an amber LED that turns ON if the assembly fails. The amber LED FLASHES if FRU beaconing is enabled.

AC module

The AC module is located at the bottom rear of the director. Either AC module can be replaced while the director is powered on and operational. The module provides:

- Two single-phase, 220 VAC, power connectors.
- An input filter and AC system harness (internal to the FRU) that provides the wiring to connect the AC power connectors to the power supplies (through the backplane).

Backplane

The backplane provides 48 VDC power distribution and connections for all logic cards. The backplane is a nonconcurrent FRU. The director must be powered off prior to FRU removal and replacement.

Tools and test equipment

This section describes tools and test equipment that may be required to test, service, and verify operation of the director and attached HAFM appliance. These tools are either supplied with the director or must be supplied by service personnel.

Tools supplied with the director

The following tools are supplied with the director. Use of the tools may be required to perform test, installation, service, or verification tasks.

- **Torque tool with hexagonal adapter**—The torque tool with 5/32" hexagonal adapter (Figure 4), is required to remove and replace director logic cards.

△ **CAUTION:** The torque tool supplied with the Director 2/140 is designed to tighten director logic cards and is set to release at a torque value of six inch-pounds. Do not use an Allen wrench or torque tool designed for use with another HP product. Use of the wrong tool may overtighten and damage logic cards.

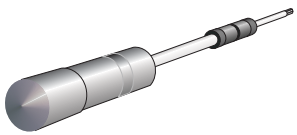


Figure 4 Torque tool and hex adapter

- **Loopback plug**—An SFP multi-mode (short-wave laser) or single-mode (long-wave laser) loopback plug (Figure 5), is required to perform port loopback diagnostic tests. One loopback plug is shipped with the director, depending on the type of port transceivers installed. Both plugs are shipped if short-wave laser and long-wave laser transceivers are installed.

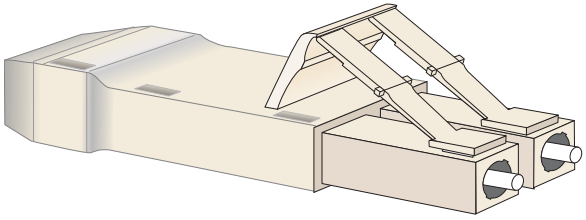


Figure 5 Loopback plug

- **Fiber-optic protective plug**—For safety and port transceiver protection, fiber-optic protective plugs (Figure 6), must be inserted in all director ports without fiber-optic cables attached. The director is shipped with protective plugs installed in all ports.

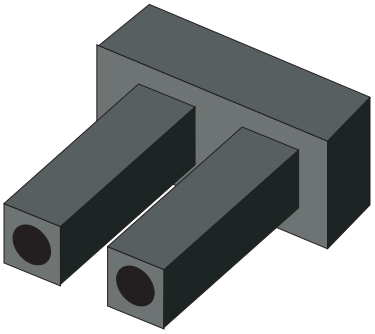


Figure 6 Fiber-Optic protective plug

- **Null modem cable**—An asynchronous RS-232 null modem cable (Figure 7) is required to configure director network addresses and acquire event log information through the maintenance port. The cable has nine conductors and DB-9 male and female connectors.

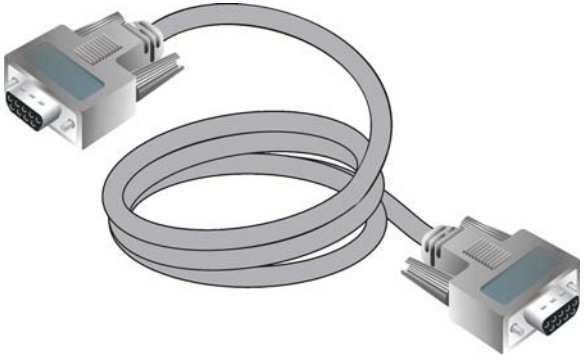


Figure 7 Null modem cable

Tools supplied by service personnel

The following tools are expected to be supplied by service personnel performing director installation or maintenance actions. Use of the tools may be required to perform one or more test, service, or verification tasks.

- **Scissors or pocket knife**—A sharp cutting edge (scissors or knife blade) may be required to cut the protective strapping when unpacking replacement FRUs.
- **Standard flat-tip and cross-tip (Phillips) screwdrivers**—Screwdrivers are required to remove, replace, adjust or tighten various FRUs, chassis, or cabinet components.
- **T10 Torx® tool**—The tool is required to rack-mount the director or to remove, replace, adjust, or tighten various chassis or cabinet components.
- **Electrostatic discharge (ESD) grounding cable with attached wrist strap**—Use of the ESD wrist strap is required when working in and around the director card cage.
- **Maintenance terminal (desktop or notebook PC)**—The PC is required to configure director network addresses and acquire event log information through the maintenance port. The PC must have:
  - The Microsoft® Windows 98®, Windows 2000®, Windows 2003®, Windows XP®, or Windows ME® operating system installed.
  - RS-232 serial communication software (such as ProComm Plus™ or HyperTerminal™) installed. HyperTerminal is provided with Windows operating systems.
- **Fiber-optic cleaning kit**—The kit contains tools and instructions to clean fiber-optic cable, connectors, loopback plugs, and protective plugs.

Optional kits

Contact your HP authorized service provider to purchase the following optional director kits. See Table 2 for descriptions of Director 2/140 optional kits.

Table 2 Director optional kits

Supporting kit	Description
HP Full Volatility License. Part Number: A7498A	Provides a license to use Full Volatility feature.
HP Open Trunking License. Part Number: A7506A	Provides a license to use Open Trunking feature.
HP SANtegrity Binding License. Part Number: 317073-B21	Provides a license to use SANtegrity Binding feature.
300m Optical Transceiver Kit, Part Number: 300834-B21	Provides short-wave optical transceiver for the director.
10km Long Distance Optical Transceiver Kit, Part Number: 300835-B21	Provides 10km long-wave optical transceiver for the director.

Table 2 Director optional kits (continued)

Supporting kit	Description
35km Extended Reach Optical Transceiver Kit, Part Number: 300836-B21	Provides 35km long-wave optical transceiver for the director.
2Gb UPM Port Module Kit, Part Number: 316094-B21	Provides 4 additional short-wave ports for the Director 2/140.

2 Installing and configuring the director

This chapter describes tasks to install, configure, and verify operation of the director. This chapter describes the following:

- Installation options, page 27
- Review installation requirements, page 27
- Unpack and inspect the director, page 29
- Configure director network information, page 39
- LAN-connect the director, page 44
- HAFM appliance, page 45
- Frequently used HAFM settings, page 50
- Connecting cables to the Fibre Channel ports, page 87
- Connecting the director to a fabric, page 72
- Unpacking, inspecting, and installing the Ethernet hub (optional), page 73
- Using HAFM from a remote location, page 73

Installation options

The director is installed in one of the following configurations:

- **Table or desk top**—One or more directors and an optional HAFM appliance are delivered and installed at the customer facility on a desk or table top. Ethernet cabling distance and local area network (LAN) addressing issues must be considered.
- **Customer-supplied equipment rack**—One or more directors and an optional HAFM appliance are delivered to the customer facility for installation in an HP or customer-supplied equipment rack. Rack-mount hardware is provided in the shipping container. Ethernet cabling, distance, and LAN addressing issues must be considered.

Review installation requirements

The director is delivered stand-alone and ready to be mounted in an HP 9000, HP 10000, HP 11000, HP system/e, or industry-standard 19-in rack. Ethernet cabling, distance, and LAN addressing issues must be considered.

Review the following checklist before installing the switch:

- Prepare a site plan. Consult the *HP StorageWorks SAN high availability planning guide*.
- Manage the director using one of the following methods:
  - A browser-capable PC and LAN segment connectivity to the HAFM appliance to support director management through HAFM and the Element Manager.
  - A browser-capable PC and Internet connectivity to support director management through the EWS interface.
- Verify that required technical personnel are available and scheduled for the installation.

- Obtain the required fiber-optic cables (multi-mode or single-mode). Verify cable length and required connectors.
- Obtain an HP 19-inch equipment rack.
- Verify that the front panel air temperature does not exceed 40 °C (104 °F) during operation.

NOTE: Height measurements are sometimes described in rail units (Us). One U is 1.75 in.

- Verify that there is space in the rack. The director is 12U (20 in) high.
- Verify that the rack is stable.
- If applicable, obtain the necessary remote workstations or Simple Network Management Protocol (SNMP) workstations. Workstations are customer-supplied and connected through a corporate or dedicated LAN.
- Verify that all other equipment installed in the rack is connected to a reliable ground connection; do not rely on connections to a branch circuit, such as a power strip.
- HP recommends securing the rack mechanically to prevent it from tipping over during a natural disaster, such as an earthquake.

Items required for installation

Locate the following items before beginning the installation procedure:

- Lift device (recommended).
- Director 2/140.
- An HP 9000, HP 10000, HP 11000, HP system/e, or industry-standard 19-in rack, or any rack with the following specifications:
  - A minimum depth of 24.5 in.
  - 19 in wide.
  - A minimum opening size of 13U available (12U for the director and 1U for space recommended for routing of cables).
- Two power outlets or different branches (for redundancy).
- Torque driver with cross-tip bit (for setting 22 in/lb. of torque).
- Fiber-optic protective plug—For safety and port transceiver protection, fiber-optic protective plugs must be inserted in all director ports without fiber-optic cables attached. The director is shipped with protective plugs installed in all ports.
- Null modem cable—An asynchronous RS-232 null modem cable is required to configure director network addresses and obtain event log information through the maintenance port. The cable has nine conductors and two DB-9 female connectors. A null modem cable specially designed for this application is supplied with the Director 2/140.
- Standard flat-tip and cross-tip Phillips screwdrivers—required to remove, replace, adjust or tighten various FRUs, chassis, or rack components.
- Electrostatic discharge (ESD) grounding cable with attached wrist strap—required when working in and around the director card cage.

- Maintenance terminal (desktop or notebook computer)—required to configure director network addresses and acquire event log information through the maintenance port. Computer requirements include:
  - Microsoft Windows 98, Windows Millennium Edition, Windows NT 4.0, Windows 2000, or Windows XP operating system installed.
  - RS-232 serial communication software (for example, ProComm Plus or HyperTerminal).

NOTE: The HAFM appliance may be used for the maintenance terminal function. The HyperTerminal application is included with the Windows 2000 operating system provided with the HAFM appliance.

Select an operating location

Install the director in a secure or limited-access area to ensure that cable connections are not compromised. Also, make sure to install the director in an area with the necessary ventilation and power requirements.

Cooling and power requirements

Two fan modules, each containing three fans (six fans total), provide cooling and redundancy fans for the director. The air intake for the director must satisfy an operating environment temperature requirement of 40°F to 104°F (4°C to 40°C).

Director power requirements:

- Input voltage: 180 to 264 VAC
- Input frequency: 47/63 Hz

△ **CAUTION:** Do not block Director 2/140 air vents. The switch uses ambient air for cooling

Unpack, inspect, and install the director

The following paragraphs provide instructions to unpack and inspect one or more Director 2/140s, and install the directors on a desktop or in a rack-mount configuration.

Unpack and inspect the director

Unpack and inspect the director(s) as follows:

1. Inspect the shipping containers for damage caused during transit. If a container is damaged, ensure a representative from the freight carrier is present when the container is opened.
2. Unpack the shipping containers and inspect each item for damage. Ensure the items match the items listed on the bill of materials (BOM).
3. If any items are damaged or missing, customers should call the toll-free telephone number printed on the service label attached to the back of the director.

Install the director on a desktop

To install the director on a desktop:

1. Position the director on a table or desktop as directed by the customer.

CAUTION: Four person lift—the director weighs approximately 167 lbs. Do not attempt to lift or carry the director with fewer than four people. Failure to observe this CAUTION may result in injury to personnel or damage to the director.

2. Verify all field-replaceable units (FRUs), including logic cards, fans, and power supplies are installed as ordered.
3. Connect the U.S. or country-specific (optional) AC power cords to the right (PS0) and left (PS1) receptacles at the rear of the director (Figure 8).

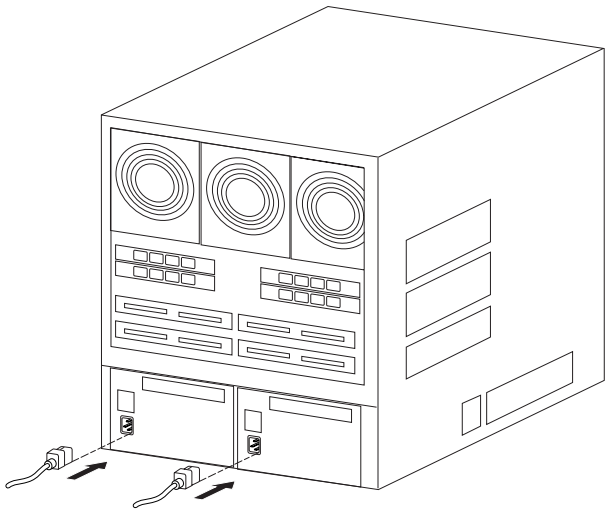


Figure 8 AC power connections (director)

WARNING! An HP-supplied power cord is provided for each director power supply. To prevent electric shock when connecting the director to primary facility power, use only the supplied power cord(s), and ensure the facility power receptacle is the correct type, supplies the required voltage, and is properly grounded.

NOTE: The director does not have a power switch. Therefore the director powers on when its power cords are connected to facility power.

4. Connect the remaining ends of the AC power cords to separate (for redundancy) facility power sources that provide single-phase, 180 to 264 volt alternating current (VAC). The director powers on and performs power-on self-tests (POSTs). During POSTs:
   a. Amber LEDs on both CTP cards and all UPM cards illuminate momentarily.
   b. The green LED on each CTP card (active and backup) illuminates as the card is tested and UPM cards are tested.
   c. Green LEDs associated with Fibre Channel ports sequentially illuminate as the ports are tested.
5. After successful POST completion, the green power LED on the front bezel, green LED on the active CTP card, and green PWR OK LEDs on both power supplies remain illuminated.
6. If a POST error or other malfunction occurs, refer to the *HP StorageWorks Director 2/140 service manual* to isolate the problem.

Install the director in a rack

This section describes the procedures used for installing a StorageWorks Director 2/140 in an appropriate HP, or comparable, 19-inch Electronic Industries Association (EIA) rack:

- HP 9000, HP 10000, and HP 11000 Series racks
- HP rack system/e or 19-inch EIA rack

Rack-mount checklist

This section describes the contents of the rack-mount kit as well as tools or equipment required to complete the installation.

Mounting hardware

Mounting hardware includes:

- Twenty-six (26) Phillips panhead screws (10-32 x 1/2) with split lock and flat washers.
- Twelve (12) Phillips flathead countersunk screws (10-32 x 3/8).
- Twenty (20) cage nuts.
- Eight (8) self-tapping sheet metal screws (10-32 x 1/2).

Brackets

Brackets and rails included in the kit are shown in Figure 9:

❶ Two (2) rear mounting brackets

❷ Four (4) angle mounting brackets (small)

❸ Two (2) shelf brackets

❹ Two (2) rear mounting plates

❺ Two (2) front mounting brackets

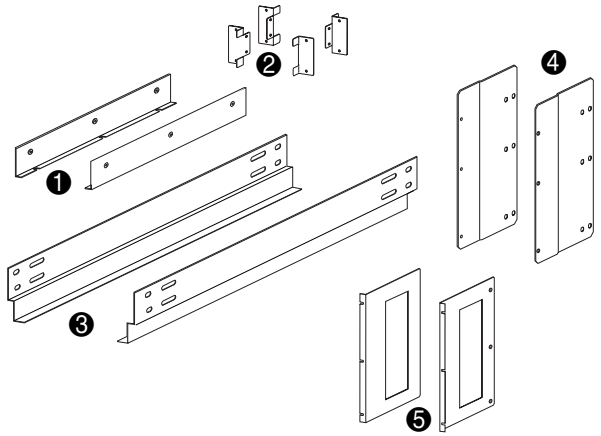


Figure 9 Brackets included in kit

Required items

Check that the following items are available before beginning the installation.

- #2 Phillips screwdriver
- Lift device (recommended)

Tips for installing more than one director

Review the following tips:

- Install the first director in the lowest position of the rack.
- Consider leaving a space of 1U open at the top and bottom of the rack, to allow easier cabling access.
- Consider leaving a space of 1U open above and below each director to allow easier cabling access.
- HP recommends installing an optional power distribution unit (PDU) in the bottom of the rack. HP ships two PDU power cords with the Director 2/140.
- Make sure to connect power cables as you install each individual director.

Moving the director

⚠ **WARNING!** Two people will need to work together to transfer the director to the lift. Make sure the wheels of the lift cannot roll as you transfer the director to the lift. Move the director slowly and carefully onto the lift to prevent back and hand injury. Dropping the director could injure personnel or damage the equipment.

Use these steps to position the director next to the rack.

1. Position the lift device next to the director.

2. Using a pallet jack, raise the pallet on which the director is mounted to the same height as the top surface of the lift device.
3. Slide the director across from the pallet to the lift device.
4. Determine the appropriate rack-mount position. Remember that the director is 20 inches or 12U high.

Installing the shelf brackets in the rack

The procedure for installing shelf brackets varies depending on the type of rack. Select the appropriate procedure for your rack type:

- "Installing the shelf brackets in HP 9000, HP 10000, and HP 11000 Series racks" on page 33.
- "Installing shelf brackets in an HP Rack system/e or 19-inch EIA rack" on page 35.

Installing the shelf brackets in HP 9000, HP 10000, and HP 11000 Series racks

Use these steps to install the two shelf brackets in an HP 9000, HP 10000, or HP 11000 Series rack.

1. Determine the appropriate placement for the director inside the rack.

NOTE: HP strongly recommends installing the Director 2/140 in the lowest position in the rack.

2. Along an exterior vertical rail of the rack cabinet, determine the position of the bottom of the shelf bracket and count 1U up from this location.
3. Use a straight edge to locate the corresponding rack hole along the interior vertical rails of the rack cabinet. Mark this location on each interior vertical rail.
4. Position a small angle bracket along the interior vertical rail (Figure 10). Align the angle bracket so that the two threaded holes on the small tab align with the 1U location marked in step 3.
5. Secure the angle bracket to the rail using two self-tapping sheet metal screws.

6. Repeat step 2 through step 5 to mount a small angle bracket on each interior vertical rail of the cabinet.

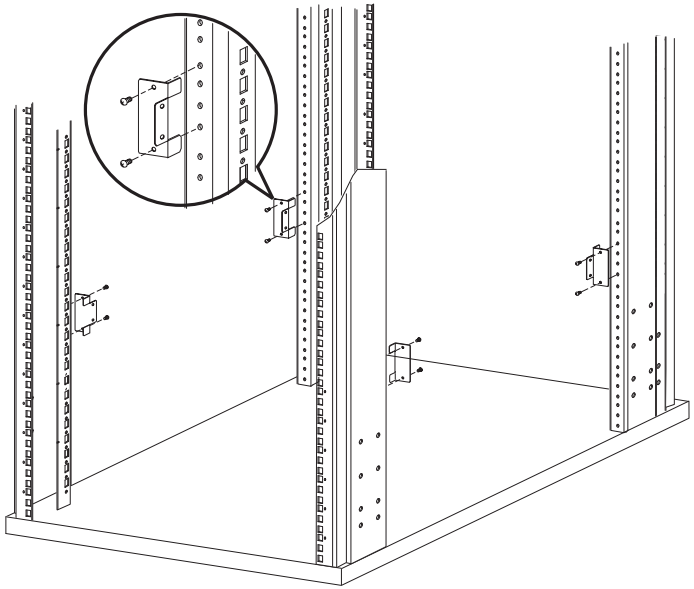


Figure 10 Angle brackets mounted on cabinet rails in HP 9000, HP 10000, and HP 11000 Series rack

7. Attach two shelf brackets to the angle brackets on each side of the cabinet using eight (8) pan head screws and a #2 Phillips head screwdriver (Figure 11).

NOTE: Center each shelf bracket between the interior vertical rails of the rack cabinet.

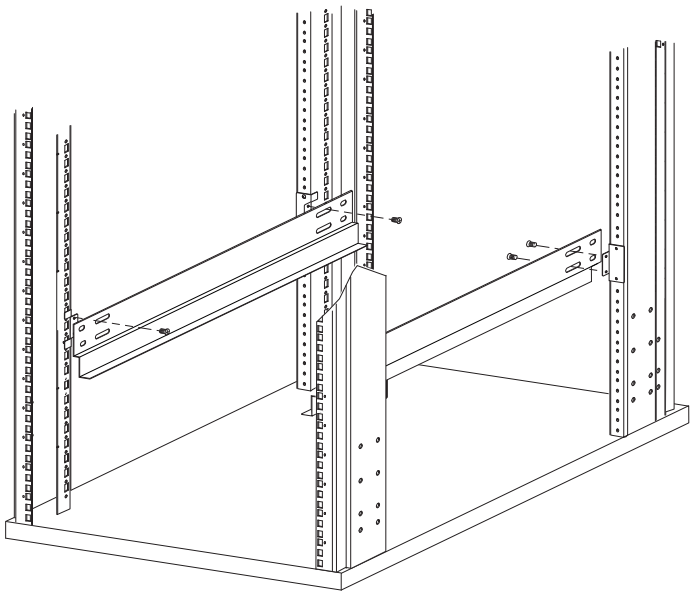


Figure 11 Shelf brackets mounted in HP 9000, HP 10000, and HP 11000 Series rack

8. Continue to "Attaching the mounting hardware to the director" on page 36.

Installing shelf brackets in an HP Rack system/e or 19-inch EIA rack

The shelf brackets mount directly to the interior vertical rails of the HP rack system/e or 19-inch EIA rack using cage nuts and Phillips panhead screws.

NOTE: The four angle brackets are not used in this rack system.

Use these steps to install the two shelf brackets in an HP rack system/e or 19-inch EIA rack.

1. Determine the appropriate placement for the director inside the rack.

NOTE: HP strongly recommends installing the Director 2/140 in the lowest position in the rack.

2. Along an exterior vertical rail of the rack cabinet, determine the position of the bottom of the shelf bracket and count 1U up from this location.
3. Use a straight edge to locate the corresponding rack holes along the interior vertical rails of the rack cabinet. Mark this location on each interior vertical rail.
4. Install two cage nuts along one interior vertical rail as marked in step 3, leaving one empty rack hole between the cage nuts.

5. Repeat step 4 for each of the three remaining interior vertical rails.
6. Secure a shelf bracket to the interior vertical rails using four (4) Phillips panhead screws with split lock and flat washers.
7. Repeat step 6 to secure the second shelf bracket on the opposite side of the rack.
8. Continue to "Attaching the mounting hardware to the director" on page 36.

Attaching the mounting hardware to the director

Use these steps to secure the mounting hardware to the director.

NOTE: All mounting brackets are attached to the director using 10/32 x 3/8-inch flathead countersunk Phillips screws.

1. Locate the two front mounting brackets in the shipping carton.
2. Secure the front mounting brackets on either side of the director (Figure 12). For each front mounting bracket, use three (3) screws.

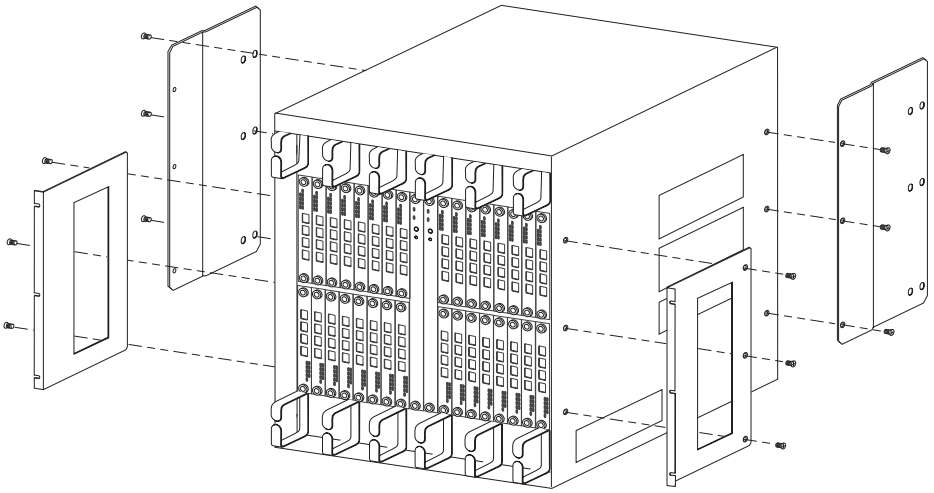


Figure 12 Securing the front mounting brackets to the Director 2/140

3. Locate the two rear mounting plates in the shipping carton.
4. Secure the two rear mounting plates to each side of the director (Figure 12). For each plate, use three (3) screws.

Inserting cage nuts in the rack

Before placing the director into the rack, insert the cage nuts into the appropriate locations along the exterior vertical rack rails. Read the following sections for instructions on inserting front and rear cage nuts in the rack.

Inserting the front cage nuts in the rack

Use these steps to insert the six (6) supplied cage nuts in the rack's front rails.

1. Select one of the exterior vertical rails at the front of the cabinet. From the bottom of the shelf bracket, count up 3U (9 holes) and insert the first of three cage nuts.
2. Count up 3U (9 holes) from the cage nut you just installed and insert the next cage nut.
3. Count up 3U (9 holes) from the second cage nut and insert the third cage nut.
4. To install cage nuts in the other front rail, repeat step 1 through step 3.

Inserting the rear cage nuts in the rack

Use these steps to insert the six (6) supplied cage nuts in the rack's rear rails.

1. Select one of the exterior vertical rails at the rear of the cabinet. From the bottom of the shelf bracket, count up 3U (9 holes) and insert the first of three cage nuts.
2. Count up 4U (12 holes) from the cage nut you just installed, and insert the next cage nut.
3. Count up 4U (12 holes) from the second cage nut and insert the third cage nut.
4. To install cage nuts in the other rear rail, repeat step 1 through step 3.

Finalizing the rack-mounting procedure

After completing the steps outlined in the previous section, prepare to orient the Director 2/140 in the rack as described in the following sections. The procedure requires two technicians.

⚠ **CAUTION:** The director weighs approximately 167 lbs. Do not attempt to lift or carry the director with fewer than two people. Failure to observe this CAUTION may result in injury to personnel or damage to the director.

Installing the director in the rack

Use these steps to maneuver the Director 2/140 into the rack:

1. Using a lift device, position the Director 2/140 at the front of the cabinet.
2. If necessary, adjust the lift height so that the bottom of the Director 2/140 is parallel with the shelf mounts in the rack.
3. Slide the director along the shelf mounts and into the cabinet until the front mounting brackets on the Director 2/140 contact the front cabinet rails.

Securing the front mounting brackets to the rack

Follow this procedure to secure the front mounting brackets attached to the Director 2/140 to the rack:

1. Secure one of the front mounting brackets to a cabinet rail by attaching three (3) Phillips panhead screws to the cage nuts you installed earlier.
2. Repeat step 1 to secure the other front mounting bracket to the remaining cabinet rail.

Securing the rear mounting brackets to the rack

Follow this procedure to attach the Director 2/140 rear mounting plates to the rack using the rear mounting bracket:

1. Align a rear mounting bracket with the cage nuts you installed earlier, and the screw holes in the rear mounting plate attached to the Director 2/140.
2. Attach a rear mounting bracket to a rear mounting plate by installing three (3) Phillips panhead screws in the mounting plate holes. Do not tighten.
3. Adjust the position of the rear bracket so that the holes align with the cage nuts installed in the cabinet rail.
4. Attach the rear mounting bracket to the cage nuts installed in the cabinet rail using three (3) Phillips panhead screws. Tighten securely.
5. Tighten the screws attached to the rear mounting plate.
6. Repeat step 1 through step 5 to attach a rear mounting bracket to the remaining rear rail.

Connecting the director to a power source

The Director 2/140 includes two power supplies (labeled PS0 and PS1 on the rear of the unit) for redundancy. Each power supply must be connected to an appropriate power source that provides 220-volt AC power.

The Director 2/140 is shipped with the following power cords:

- Two (2) PDU (power distribution unit) power cords
- Two (2) volt AC power cords

NOTE: The 110-volt AC power cords provided in the kit are not for use with the Director 2/140. For more information, see the *HP StorageWorks director power cord advisory*.

WARNING! To prevent electric shock, use only the supplied PDU power cord(s). Also, verify that the facility power receptacle is the correct type, supplies the required voltage, and is properly grounded.

Connect each Director 2/140 power supply to a power distribution unit (PDU) receptacle using a PDU power cord (Figure 13).

NOTE: To ensure redundancy, install a second, optional PDU; and connect each PDU power cord to a separate PDU. Note that the Director 2/140 does not have a power switch. Therefore, the Director 2/140 powers on when its power cords are connected to facility power.

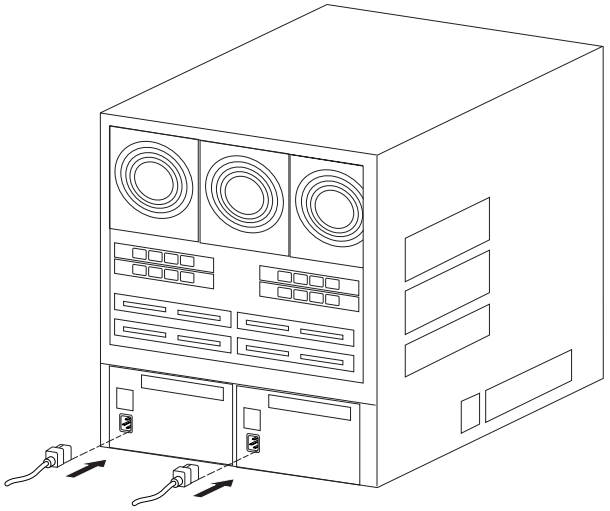


Figure 13 AC power connections (director)

Power-on self test

Use the following steps to run a power-on self test (POST):

1. Power on the PDUs (if used).

   The director powers on. The following occurs during POST:

   - Amber LEDs on both CTP cards and all UPM cards illuminate momentarily.
   - The green LED on each CTP card (active and backup) turns ON as the card is tested and UPM cards are tested.
   - Green LEDs associated with Fibre Channel ports sequentially illuminate as the ports are tested.

2. After successful POST completion, the green power LED on the front bezel, green LED on the active CTP card, and green PWR OK LEDs on both power supplies remain ON.
3. If a POST error or other malfunction occurs, refer to the *HP StorageWorks Director 2/140 service manual*.

Configure director network information

Use the following sections to configure the director's network addressing scheme.

Default settings

The director is delivered with the following default network addresses:

- **MAC address**—The Media Access Control (MAC) address is programmed into FLASH memory on the CTP card at the time of manufacture. The address is in *xx.xx.xx.xx.xx.xx* format, where *xx* is a hexadecimal pair.
- **IP address**—The factory preset, default IP address is 10.1.1.10. If the Reset Configuration option is selected from HAFM, the director resets to the default address of 10.1.1.10.

  If multiple directors are installed on the same LAN, each director (and appliance) must use a unique IP address. One director can use the factory-set address, but the addresses of the remaining directors require change.

NOTE: If multiple directors and the HAFM appliance are delivered in an HP-supplied equipment cabinet, all devices are configured with unique IP addresses that do not require change. The addresses require change only if multiple equipment cabinets are LAN-connected.

- **Subnet mask**—The subnet mask is 255.0.0.0. If the director is installed on a complex public LAN with one or more routers, the address may require change.
- **Gateway address**—The gateway address is 0.0.0.0. If the director is installed on a dedicated LAN with no connection through a router, the address does not require change. If the director is installed on a public LAN (corporate intranet), the gateway address must be changed to the address of the corporate intranet's local router.

Verify the type of LAN installation with the customer's network administrator. If one director is installed on a dedicated LAN, network addresses must be verified but do not require change.

Changing the director's IP address

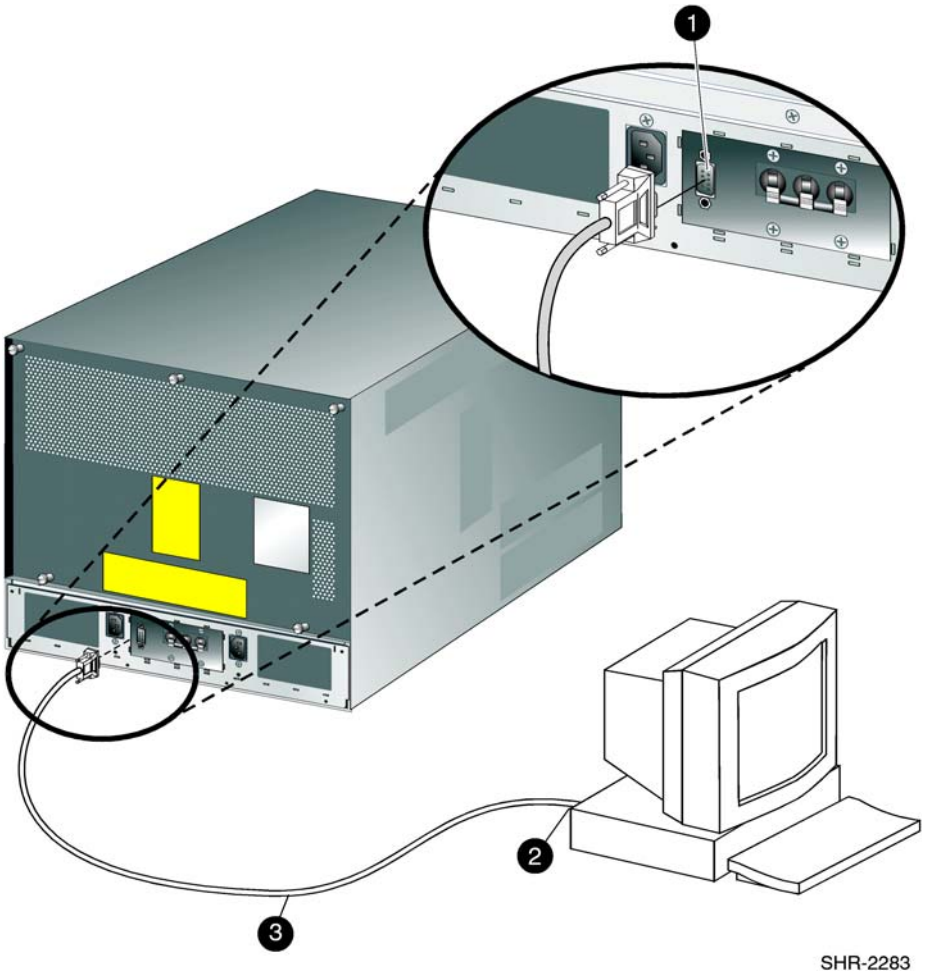
If multiple directors are installed, or a public LAN segment is used, network addresses must be changed to conform to the customer's LAN addressing scheme. The following items are required to perform this task:

- A local workstation (desktop or notebook computer) with:
  - Microsoft Windows 98, Windows 2000, Windows 2003, Windows XP, Windows Millennium Edition, or Windows NT 4.0 operating system
  - RS-232 serial communication software (for example, ProComm Plus or HyperTerminal)

  Note that the HAFM appliance may be used for this function and that HyperTerminal is included in Windows 2000 provided in the HAFM appliance.
- An asynchronous RS-232 null modem cable (supplied with the Director 2/140)

Use the following steps to verify or change (if required) a director IP address, subnet mask, or gateway address:

1. Remove the protective cap from the 9-pin maintenance port at the rear of the director (a flat-tip screwdriver may be required). See Figure 14 ❶.



1 Maintenance port
2 RS-232 port
3 Null Modem cable

Figure 14 Connecting the null modem cable between the director and a workstation

2. Connect the 9-pin end of the RS-232 modem cable to the maintenance port.
3. Connect the other cable end to a 9-pin communication port (COM1 or COM2) at the rear of the local workstation.
4. Select **Start > Programs > Accessories > Communications > HyperTerminal**.

The Connection Description dialog box appears (Figure 15).

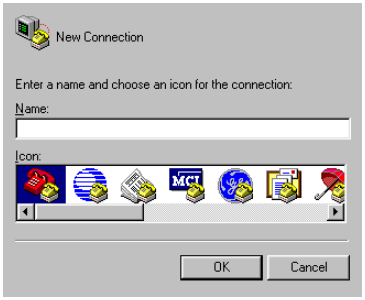


Figure 15 Connection Description dialog box

5. Enter **2140** in the Name box and click **OK**.
   The Connect To dialog box appears (Figure 16).

Figure 16 Connect To dialog box

6. Ensure the Connect using box displays COM1 or COM2 (depending on the serial communication port connection to the director) and click **OK**.
   The COMn Properties dialog box appears (Figure 17).

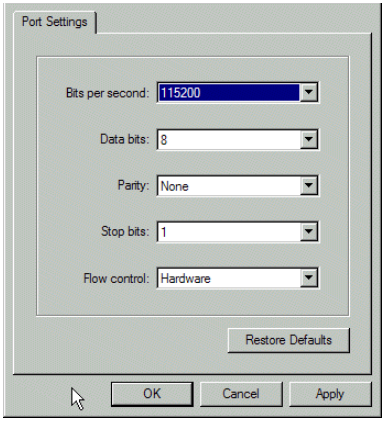


Figure 17 COMn Properties dialog box

7. Configure the Port Settings parameters as follows:

- Bits per second: 115200
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: Hardware

8. Click **OK**.

   The HyperTerminal window appears.

9. At the > prompt, enter the user-level password (the default is password) and press **Enter**. The password is case-sensitive.

   The HyperTerminal window appears with a C> prompt at the top of the window (Figure 18).

10. At the C> prompt, enter **ipconfig** and press **Enter**.

    The HyperTerminal window lists the following:

    - MAC Address
    - IP Address (default is 10.1.1.10)
    - Subnet Mask (default is 255.0.0.0)
    - Gateway Address (default is 0.0.0.0)
    - Auto Negotiate
    - Speed
    - Duplex

    Only the IP Address, Subnet Mask, and Gateway Address fields are configurable.

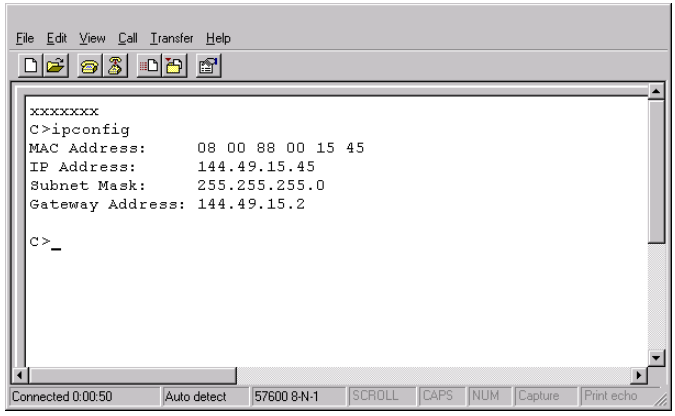


Figure 18 HyperTerminal window

11. To change director network addresses, enter the following at the C> prompt:

    ipconfig *xxx.xxx.xxx.xxx.yyy.yyy.yyy.yyy.zzz.zzz.zzz.zzz*

    The IP address format is xxx.xxx.xxx.xxx. The subnet mask format is yyy.yyy.yyy.yyy. The gateway address format is zzz.zzz.zzz.zzz. The octets xxx, yyy, and zzz are decimals from 0 through 255. If a network address is to remain unchanged, enter the current address in the respective box.

12. Press **Enter**.

When the new network addresses are configured at the director, the message `Request completed OK` appears at the bottom of the HyperTerminal window.

13. Select **Exit** from the File menu.

    A HyperTerminal dialog box appears (Figure 19).

Figure 19 HyperTerminal dialog box (1)

14. Click **Yes**.

    A second HyperTerminal dialog box appears (Figure 20).

Figure 20 HyperTerminal dialog box (2)

15. Click **No** to exit and close the HyperTerminal application.
16. Power off the maintenance terminal:
    a. Select **Start > Shut Down.**

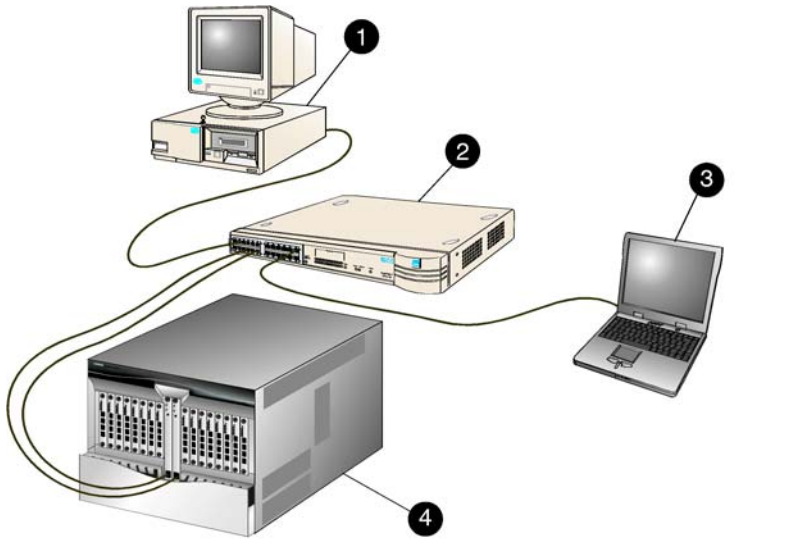
       The Shut Down Windows dialog box appears.

    b. Select **Shut down** and then click **OK** to power off the PC.
17. Disconnect the RS-232 null modem cable from the director and the maintenance terminal. Replace the protective cap over the maintenance port.
18. IPL the director.

LAN-connect the director

Use these steps to connect the rack-mounted director to the Ethernet LAN segment.

1. Connect one end of an Ethernet cable to the RJ-45 connector on each CTP card (Figure 21).



1	Remote workstation	3	HAFM appliance (laptop or rack-mount)
2	Ethernet hub or switch (customer supplied)	4	Director 2/140

Figure 21 LAN-connect the director

2. Connect the remaining end of each Ethernet cable to the LAN as directed by the customer's network administrator.

NOTE: If an HAFM appliance is not available, use the Embedded Web Server (EWS) interface. Attach the Ethernet LAN segment to an Internet connection.

HAFM appliance

To run HAFM software, you must set up and configure the HAFM appliance. Refer to the *HP StorageWorks HA-Fabric Manager appliance installation guide* for instructions on:

- Setting up the HAFM appliance
- Connecting the HAFM appliance to the LAN
- Configuring the network addresses and passwords for the HAFM appliance
- Setting HAFM appliance date and time
- Configuring and enabling event notification features
- Creating HAFM user names and passwords

Record or verify HAFM appliance restore information

Configuration information must be recorded to restore the HAFM appliance in case of hard drive failure. The Windows 2000 operating system and the HAFM and director Element Manager must also be restored. Refer to the *HP StorageWorks Director 2/140 service manual* for instructions.

To record or verify HAFM appliance configuration information, refer to the *HP StorageWorks HA-Fabric Manager appliance installation guide* for instructions.

Enabling HAFM to manage the director

A new director must be recognized by the HAFM application to be managed. Follow these steps to enable HAFM to recognize a new director:

1. At the HAFM application, select **Discover > Setup**.
   The Discover Setup dialog box appears (Figure 22).

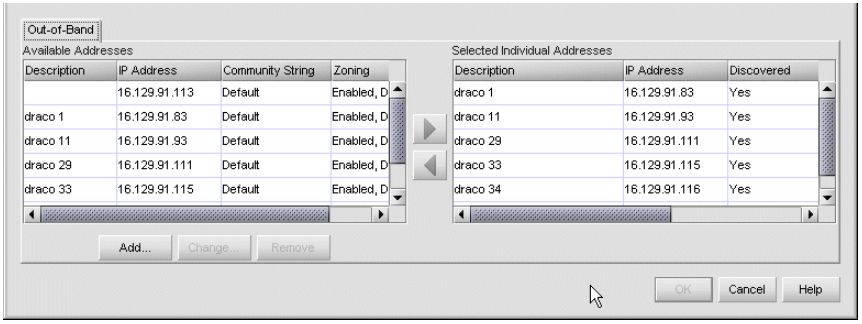


Figure 22 Discover Setup dialog box

2. Click **Add**.
   The Domain Information dialog box appears with the IP Address page open (Figure 23).

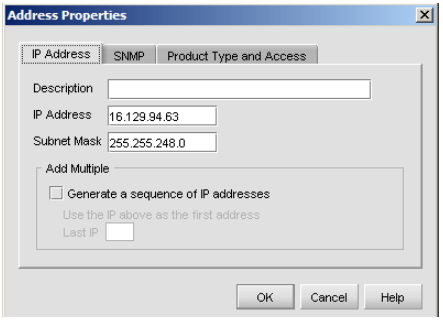


Figure 23 Domain Information dialog box (IP Address page)

3. Enter a director description in the Description box.
4. Enter the IP address you configured earlier. See "Configure director network information" on page 39.
5. Enter the director subnet mask (determined by the customer network administrator) in the Subnet Mask box.

6. If you want to generate a sequence of IP addresses, perform the following:
   a. Select the **Generate a sequence of IP addresses** box.
   b. Enter the last IP address in the Last IP box.

NOTE: All IP addresses in a sequence must be on the same subnet and have the same first three octets.

7. Click **OK**.

Verify communication between the director and HAFM appliance

Follow these steps to check director-to-server communication:

1. At the HAFM application main window (physical map or product list), inspect the shape and color of the status symbol associated with the director icon. Table 3 explains these symbols.

Table 3 Director operational states and symbols

Operational state	Symbol
Operational—Director-to-server communication has been established, the director is operational, and no failures are indicated.	No status symbol
Degraded—Director-to-server communication has been established, but the director is operating in degraded mode and requires service. This condition is typical if a port or redundant FRU fails. Go to step 2.	
Failed—Director-to-server communication has been established, but the director failed and requires immediate service. Go to step 2.	
Status Unknown—The director status is unknown because of a network communication failure between the director and HAFM appliance. Go to step 2.	

2. Right-click the **Director-140** icon. A pop-up menu for the selected director appears.
3. Check director status at the Hardware View page (Figure 24), and complete one of the following steps:
   - If the director is displayed as operational (no FRU alert symbols), go to "Configuring feature key" on page 71.
   - If director operation is displayed as degraded or a director failure is indicated (FRU alert symbols and a yellow triangle or red diamond at the alert panel), refer to the *HP StorageWorks Director 2/140 service manual.*

In the example, the director's status is operational as indicated by the green circle in the alert panel.

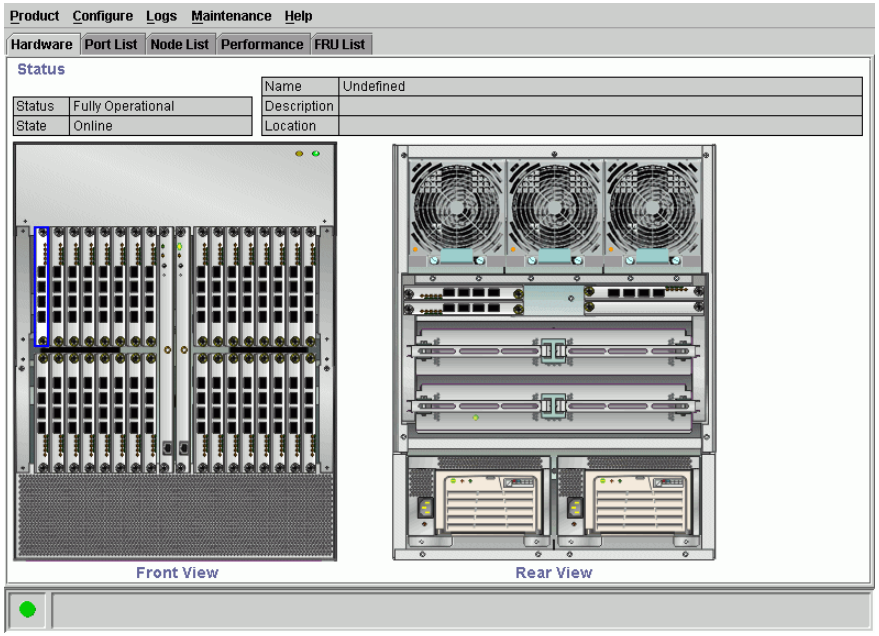


Figure 24 Hardware View page

Set director date and time

The Director Element Manager log entries are stamped with the date and time received from the director. Use these steps to set the effective date and time for the director:

NOTE: The director and HAFM synchronize at least once daily.

1. At the Hardware View, select **Configure > Date/Time**.
   The Configure Date and Time dialog box appears (Figure 25).
2. Set director date and time manually, or set it to periodically synchronizes with the HAFM. For specific instructions, see the following sections:
   - Set date and time manually, page 49

- Synchronize date and time, page 49

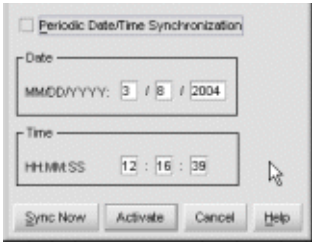


Figure 25 Configure Date and Time dialog box

Set date and time manually

Use these steps to set the director date and time manually:

1. At the Configure Date and Time dialog box, select the **Periodic Date/Time Synchronization** box to deselect the option (no check in the box).

   The grayed-out Date and Time fields activate.
2. Click the Date boxes that require change, and enter numbers in the following ranges:

   Month (MM): 1 through 12
   Day (DD): 1 through 31
   Year (YYYY): greater than 1980
3. Click the Time boxes that require change, and enter numbers in the following ranges:

   Hour (HH): 0 through 23
   Minute (MM): 0 through 59
   Second (SS): 0 through 59
4. Click **Activate** to set the director date and time.

Synchronize date and time

Use these steps to set the director to periodically synchronize date and time with HAFM:

1. At the Configure Date and Time dialog box, select the **Periodic Date/Time Synchronization** box.

   The Date and Time boxes are grayed-out and not selectable.
2. Click **Activate** to enable synchronization.

   The director date and time synchronize with the HAFM date and time at the next update period (at least once daily).
3. Click **Sync Now** to synchronize the director and HAFM immediately.

   The Date and Time Synced dialog box appears.

Figure 26 Date and Time Synced dialog box

4. Click **OK**.
5. Click **Activate** to enable synchronization.

Frequently used HAFM settings

This section summarizes the most common HAFM tasks including:

NOTE: For a complete reference on HAFM functionality, refer to the *HAFM user guide*.

- Setting the director online, page 50
- Setting the director offline, page 51
- Configuring director identification, page 51
- Configuring director management style, page 52
- Configuring switch parameters, page 52
- Configuring fabric parameters, page 55
- Configuring preferred path, page 57
- Configuring switch binding, page 58
- Configuring ports, page 58
- Configuring port addresses (FICON), page 60
- Configuring SNMP trap message recipients, page 60
- Configuring and enabling e-mail notification, page 61
- Configuring and enabling call-home features, page 64
- Configuring and enabling Ethernet events, page 64
- Configuring threshold alerts, page 64
- Configure SANtegrity Authentication dialog box, page 71
- Configuring Open Systems Management Server, page 71
- Configuring FICON Management Server, page 71
- Configuring feature key, page 71
- Configuring Open Trunking, page 71
- Enabling Embedded Web Server, page 72
- Enabling Telnet, page 72

Setting the director online

When the director is set online, an attached device can log into the director if the port is not blocked. Attached devices can communicate with each other if they are configured in the same zone. Use these steps to set the director online:

1. Open HAFM.
   The View All - HAFM 8.6 page appears.
2. Double-click the appropriate director icon.
   The Hardware View page for the selected director appears.
3. Select **Maintenance > Set Online State**.

If the director is offline, the Set Online State dialog box appears, indicating the status is Offline.

4. Click **Set Online**.

   A Warning dialog box appears, indicating status is online.

5. Click **OK**.

   The Status table appears Online.

Setting the director offline

When the director is set offline, all ports are set offline. The director transmits the offline sequence (OLS) to attached devices, and the devices cannot log in to the director. Use these steps to set the director offline:

1. Notify the customer that the director is going offline.
1. Open HAFM.

   The View All - HAFM 8.6 page appears.

2. Select the appropriate director icon.

   The Hardware View page for the selected director appears.

3. Select **Maintenance > Set Online State**.

   If the director is online, the Set Online State dialog box appears, indicating the status is Online.

4. Click **Set Offline**.

   A Warning dialog box appears, indicating the director will be set offline.

5. Click **OK**.

Configuring director identification

Perform this procedure to configure the director name, description, location, and contact person for HAFM. The information appears in multiple dialog boxes throughout the application. In addition, the Name, Location, and Contact variables configured in the Configure Identification dialog box correspond respectively to the SNMP variables sysName, sysLocation, and sysContact. These variables are used by SNMP management workstations when obtaining data from managed directors.

Follow these steps to configure the director identification:

1. At the Hardware View page, select **Configure > Identification**.

   The Configure Identification dialog box appears (Figure 27).

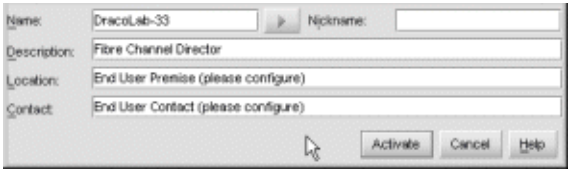


Figure 27 Configure Identification dialog box

2. Enter a director name of 24 or fewer alphanumeric characters in the Name box.

Each director should be configured with a unique name. If the director is installed on a public LAN, the name should reflect the director's Ethernet network DNS host name. For example, if the DNS host name is SAN140.hp.com, the name entered in this dialog box is `SAN140`.

3. Enter a director description of 255 or fewer alphanumeric characters in the Description box.
4. Enter the director's physical location (255 or fewer alphanumeric characters) in the Location box.
5. Enter the name of a contact person (255 or fewer alphanumeric characters) in the Contact box.
6. Click **Copy** if you want to use the name in the Name box as a nickname for the director WWN.

   The nickname appears instead of the WWN in Element Manager views.
7. Click **Activate** to save the information and close the dialog box.

Configuring director management style

NOTE: To change this value, you must first set the director offline. Be sure to set the director back online after you change this value.

Perform this procedure to set the director to open systems or FICON management style. This setting only affects the management style used to manage the director; it does not affect port operation. OSI devices can communicate with each other if the director is set to FICON management style, and FICON devices can communicate with each other if the director is set to open systems management style.

NOTE: If the FICON management server feature is enabled, the default management style is FICON. Open systems management style cannot be enabled.

To configure the director management style:

1. Ensure the director is set offline. For instructions, see "Setting the director offline" on page 51.
2. Select **Product > Management Style**.

   The Configure Management menu appears.
3. Select the management style as follows:
   - Use **Open Systems** for all other (non-FICON) Fibre Channel environments.
   - If the FICON Management Server feature is enabled, the default style is **FICON**. The management style cannot be changed to Open Systems with the FICON Management Server feature enabled.
4. Set the director online. For instructions, see "Setting the director online" on page 50.

Configuring switch parameters

Use the procedures in this section to set parameters on the director for fabric operation through the Configure Switch Parameters dialog box. These parameters are stored in NV-RAM on the director.

1. Set the director is offline. See "Setting the director offline" on page 51.

△ **CAUTION:** Setting the director offline terminates all Fibre Channel connections.

2. Select **Configure > Operating Parameters > Switch Parameters**.
   The Configure Switch Parameters dialog box appears (Figure 28).

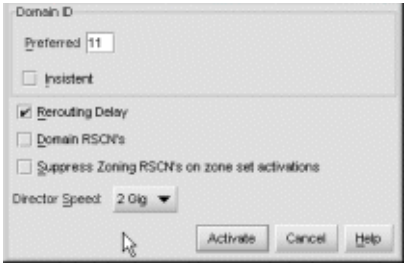


Figure 28 Configure Switch Parameters dialog box

Ordinarily, you do not need to change values in this dialog box from their defaults. The only exception is the Preferred Domain ID. Change this value if the director will participate in a multi-switch fabric.

3. Change settings as required in this dialog box. Each switch parameter is described in detail in Switch parameters, page 53.
4. Click **Activate**.
5. Set the director online. See "Setting the director online" on page 50.

Switch parameters

Configure the following parameters as required by your fabric.

Domain ID

The domain identification is a value between 1 and 31 that provides a unique identification for the director in a fabric. A fabric director cannot contain the same domain ID as another director or their E_Ports will segment when they try to join.

In the Configure Switch Parameters dialog box, a box is provided to enter a preferred domain ID and a check box is provided to enable this ID as an insistent domain ID.

Preferred

NOTE: To change this value, you must first set the director offline. Be sure to set the director back online after you change this value.

Use this box to set a unique domain ID for the director. The default value is 1. Set a value between 1 and 31. When a director comes online with a preferred ID, it requests an ID from the fabric's principal director (indicating its preferred value as part of the request). If the requested domain ID is not allocated to the fabric, the domain ID is assigned to the requesting director. If the requested

domain ID is already allocated, an unused domain ID is assigned. Note that you must set the director offline before you can change to the preferred domain ID.

The preferred domain ID must be unique for each director and switch in a fabric. If two switches or directors have the same preferred domain ID, the E_Ports segment, causing the fabric to segment.

For more information on domain ID, refer to the section on domain ID assignment for multi-switch fabrics in the planning guide.

Insistent

This option is not supported unless the SANtegrity Binding feature is installed. Click the check box to enable or disable this feature. The default state is disabled (no check).

When you select Insistent, the domain ID configured in the Preferred Domain ID box becomes the active domain identification when the fabric initializes.

- This option is required if Enterprise Fabric Mode (optional SANtegrity Binding feature) is enabled.
- If you enable Insistent Domain while the switch or director is online, the Preferred Domain ID will change to the current active domain ID if the IDs are different.

△ **CAUTION:** If a director with a duplicate domain ID exists in the fabric, both directors' E_Ports will segment when they try to join.

Rerouting delay

The Rerouting Delay option is only applicable if the configured director is in a multi-switch fabric.

Enabling rerouting delay ensures that frames are delivered in order through the fabric to their destination. If there is a change to the fabric topology that creates a new path (for example, a new director is added to the fabric), frames may be routed over this new path if its hop count is less than a previous path with a minimum hop count. This may result in frames being delivered to a destination out of order since frames sent over the new, shorter path may arrive ahead of older frames still in route over the older path.

If rerouting delay is enabled, traffic ceases in the fabric for the time specified in the E_D_TOV box of the Configure Fabric Parameters dialog box. This delay allows frames sent on the old path to exit to their destination before new frames begin traversing the new path.

NOTE: This option is required if Enterprise Fabric Mode (optional SANtegrity Binding feature) is enabled. The default state is enabled.

Domain RSCNs

Domain register for state change notifications (domain RSCNs) are sent between end devices in a fabric to provide additional connection information to host bus adapters (HBA) and storage devices. As an example, this information might indicate that a logical path has been broken because of a physical event, such as a fiber optic cable being disconnected from a port. Consult with your HBA

and storage device vendor to determine if enabling Domain RSCNs will cause problems with your HBA or storage products.

NOTE: This option is required if Enterprise Fabric Mode (optional SANtegrity Binding feature) is enabled. The default state is enabled.

Suppress RSCNs on zone set activations

Fabric format domain register for state change notifications (RSCNs) are sent to ports on the switch following any change to the fabric's active zone set. These changes include activating and deactivating the zone set, or enabling and disabling the default zone. When the Suppress RSCNs on Zone Set Activations box is selected, fabric format RSCNs are not sent for zone changes to the attached devices on the switch. Click the box to remove or add a check mark.

In most cases this it is desirable to enable this option so that attached devices can receive notification of zoning changes in the fabric. However, some HBAs may log out, then log back into the fabric when they receive an RSCN, thereby disrupting Fibre Channel traffic. Consult with your HBA and storage device vendor to determine if disabling this option (and thereby enabling RSCN transmission) will cause problems with your HBA or storage products. This option is disabled by default.

Configuring fabric parameters

Use procedures in this section to set parameters on the director for fabric operation through the Configure Fabric Parameters dialog box. These parameters are stored in NV-RAM on the director.

1. Verify that the director is set offline. For instructions, see "Setting the director offline" on page 51.

CAUTION: Setting the director offline terminates all Fibre Channel connections.

2. Select **Configure > Operating Parameters > Fabric Parameters**.
   The Configure Fabric Parameters dialog box appears (Figure 29).

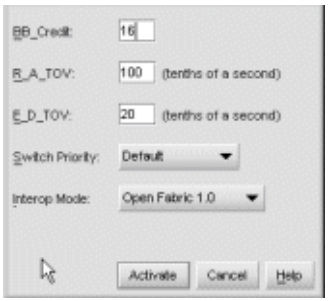


Figure 29 Configure Fabric Parameters dialog box

3. Use information under "Fabric parameters" to change settings as required for parameters in this dialog box.

4. After you change settings, click **Activate**.
5. Back up the configuration data when you are finished configuring the switch.
6. Set the director online. For instructions, see "Setting the director online" on page 50.

Fabric parameters

Configure the following parameters as required by your fabric.

BB_Credit

Configure the director to support buffer-to-buffer credit (BB_Credit) from 1 through 60. This is the value used for all ports, except those configured for extended distance buffering (10-100 km). The default value is 16. For a description of the buffer-to-buffer credit, refer to the industry specification, *Fibre Channel physical and signaling interface*.

R_A_TOV

Configure resource allocation time-out value (R_A_TOV) in tenth-of-a-second increments. This variable works with the error detect time-out value (E_D_TOV) variable to control the director's behavior when an error condition occurs. Resources are allocated to a circuit when errors are detected and are not released for reuse until the time set by the R_A_TOV value expires. The default value is 100 tenths (10 seconds). Set a value between 10 tenths and 1200 tenths (1 through 120 seconds).

NOTE: Set the same value for R_A_TOV on all directors and edge switches in a multi-switch fabric. If the value is not the same on all units, the fabric segments. Also, the value for R_A_TOV must be greater than the value configured for E_D_TOV.

E_D_TOV

Adjust the E_D_TOV in tenth-of-a-second increments. An error condition occurs when an expected response is not received within the time limit set by this value. The default value is 20 tenths (2 seconds). Set a value between 2 tenths through 600 tenths (.2 through 60 seconds).

NOTE: Set the same value for E_D_TOV on all switches and directors in a multi-switch fabric. If the value is not the same, the fabric segments.

Switch priority

Setting this value determines the principal director for the multi-switch fabric. Select Principal (highest priority), Default, or Never Principal (lowest priority) from the Switch Priority list.

Setting these priority values determines the principal director selected for the multi-switch fabric. For example, if you have three directors in the fabric and set one as Principal, one as Default, and one as Never Principal, the unit set to Principal becomes the principal director in the fabric.

If all directors are set to Principal or Default, the director with the highest priority and the lowest WWN becomes the principal director. The following are some examples of principal director selection when directors have these settings:

- If you have three directors and set all to Default, the director with the lowest WWN becomes the principal director.
- If you have three directors and set two to Principal and one to Default, the director with the Principal setting that has the lowest WWN becomes the principal director.
- If you have three directors and set two to Default and one to Never Principal, the director with the Default setting and the lowest WWN becomes the principal director.

At least one director in a multi-switch fabric needs to be set as Principal or Default. If all of the directors are set to Never Principal, all of the interswitch links (ISLs) will segment. If all but one director is set to Never Principal and the director that was principal goes offline, then all of the other ISLs will segment.

NOTE: HP recommends you leave the switch priority setting as Default. If you are considering setting this value to something other than default, refer to the section on principal switch selection for multi-switch fabrics in the *HP StorageWorks SAN high availability planning guide* for details.

For example, in the audit log, you may notice that the Principal setting maps to a number code of 1, Default maps to a number code of 254, and Never Principal maps to a number code of 255. The number codes of 2-253 are not currently in use.

Interop mode

Select one of the following options:

- **Homogeneous Fabric**—Select this mode if the fabric contains only HP directors and edge switches that are operating in Homogeneous Fabric mode.
- **Open Fabric 1.0**—Default. Select this mode if the fabric contains HP directors and edge switches, as well as other open-fabric compliant switches. Select this mode for managing heterogeneous fabrics.

NOTE: Selecting Open Fabric 1.0 disables the default zone. You must activate the default zone or enable the active zone set.

Configuring preferred path

The preferred path feature allows a user to specify and configure one or more ISL data paths between multiple directors or switches in a fabric. Each participating director or switch must be configured as part of a desired path. For complete procedures on configuring this optional feature, refer to the *HP StorageWorks Director Element Manager user guide*.

Configuring switch binding

This feature is managed through the Switch Binding submenu options available on the Element Manager Configure menu. Using Switch Binding, you can specify devices and switches that can attach to director and switch ports. This provides security in environments that include a large number of devices by ensuring that only the intended set of devices attach to a switch or director. For complete procedures on configuring this optional feature, refer to *HP StorageWorks Director Element Manager user guide*.

Configuring ports

Perform this procedure to define Fibre Channel port names, configure ports as blocked or unblocked, enable extended distance operation and Link Incident (LIN) alerts, and define port types.

1. At the Hardware View page, select **Configure > Ports**.

   The Configure Ports dialog box appears (Figure 30).

   a. Select a blank Name box and enter a descriptive port name of 24 or fewer alphanumeric characters. Use a unique name that reflects the device connected to the port. This name will be associated with the port and will not change regardless of the device connected.

   b. Select the **Blocked** box to block a port, or deselect the blocked box to unblock the port.

   A check in the box indicates that the port is blocked. Blocking the port prevents the attached device from communicating with the director. A blocked port continuously transmits the offline sequence.

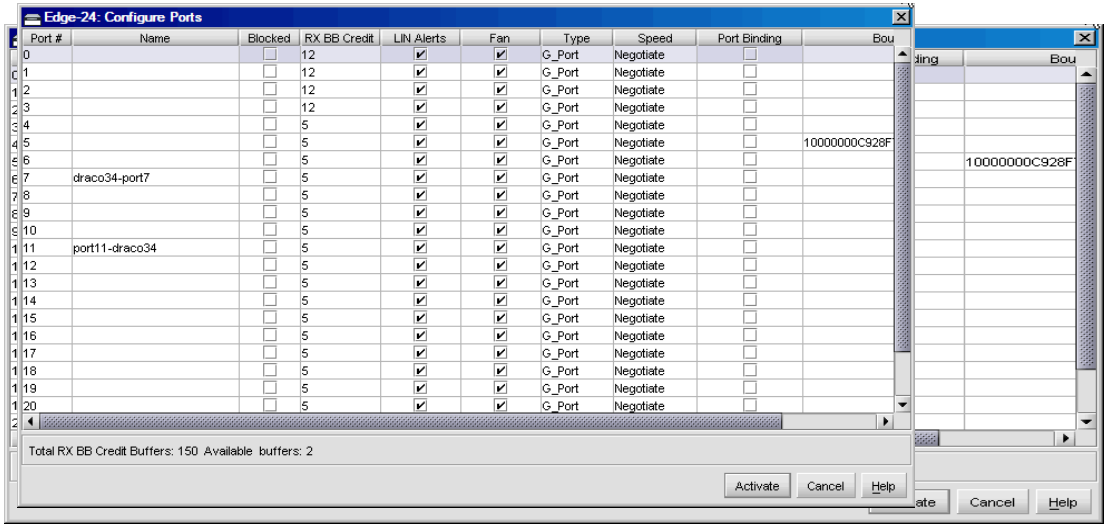


Figure 30 Configure Ports dialog box

   c. Select the 10-100 km box to enable extended distance buffering for a port.

   A check in the box indicates the extended distance operation up to 100 kilometers (through repeaters) is enabled.

NOTE: If the director supports BB_Credits by port, the 10-100 Km column is replaced by an RX BB Credit column.

d. If the director supports BB_Credits by port, right-click the RX BB Credit column.
The RX BB Credits dialog box appears.

NOTE: The port must be offline to change the BB_Credit field.

- For switches without buffer pools, this dialog box allows you to:
  Set all... to set all ports to a single value (the Set All RX BB Credits dialog box appears for you to enter the RX BB value)
  Set all to maximum to set all ports to a maximum BB_Credit value. Maximum allowable port BB_Credit values vary by director
- For switches with buffer pools, this dialog box allows you to:
  Set all... to set all ports to a single value (the Set All RX BB Credits dialog box appears for you to enter the RX BB value)
  Distribute to evenly distribute the pool buffers among all ports.

Click OK to change the values in the Configure Port dialog box.

Click Activate to change the values on the director.

An RX BB Credit Confirmation box displays.

In addition to the maximum BB-Credit limit per port, the total BB_Credits allocated to all ports cannot exceed the buffer pool size.

NOTE: Only 24-Port switches have a switch-wide buffer pool. The Configure Ports dialog box shows the total and available buffers at the bottom of the dialog box. When you change information in the RX BB Credit column, the buffer information automatically updates. Ports for the 24-Port switches can be individually configured between 2-12, with a total number of port credits of 150.

e. Select the LIN Alerts box to enable or disable LIN alerts for a port.
A check in the box indicates alerts are enabled. When the feature is enabled and an incident occurs on the link, an alert indicator (yellow triangle) appears at the Hardware View, Port List View, and Port Card View pages, and a message is sent to configured e-mail recipients. LIN alerts are enabled by default.

f. Select a Type box and select generic port (G_Port), fabric port (F_Port), or expansion port (E_Port) from the list. If F_Port or E_Port is selected, the port will only operate as the port type selected. If G_Port is selected, the port type is automatically detected and will operate as an E_Port or F_Port.

g. Click the Speed box for a port.

A Speed list appears.

Select 1Gb/sec, 2Gb/sec, or Negotiate as the desired setting depending on the speed capability of the device to be plugged into the port. A right-click in the Speed column allows selecting from a pop-up menu to set all ports to 1Gb/sec, 2Gb/sec, or Negotiate.

h. Click the Port Binding box to enable WWN binding for the port, which allows only a specific device to attach to the port.

This device is specified by the WWN or nickname entered into the Bound WWN column. With the box cleared, any device can attach to the port even if a WWN or nickname is specified in the Bound WWN column.

i. In the Bound WWN box, enter a world wide name (WWN) in the correct format (*xx.xx.xx.xx.xx.xx.xx.xx*) or a nickname configured through the Element Manager.

If Port Binding is enabled, the device with this WWN or nickname has exclusive attachment to the port. If Port Binding is enabled but an invalid WWN or nickname is entered in this box, no device can connect to the port. If a valid WWN or nickname is entered but the Port Binding is not checked, the WWN or nickname is stored and all devices can connect to the port.

2. Use the vertical scroll bar as necessary to display additional port information rows (up to 140 ports).
3. Click **Activate** to save the configuration information and close the dialog box.

   If any port speed was changed, an information message box appears stating, "`Port speed changes will temporarily disrupt port data transfers. Would you like to continue?`"
4. Click **Yes** to complete activation.

Configuring port addresses (FICON)

If the director is set to FICON management style, perform this procedure to access the director matrix and define Fibre Channel port names, configure ports as blocked or unblocked, and define the CUP name. For instructions on configuring port addresses, refer to *HP StorageWorks Director Element Manager user guide* for details.

Configuring SNMP trap message recipients

Use this procedure to configure community names, write authorizations, network addresses, and UDP port number for up to 6 SNMP trap message recipients. A trap recipient is a management workstation that receives notification through SNMP.

1. At the Hardware View page, select **Configure > SNMP Agent**.

The Configure SNMP dialog box appears (Figure 31).

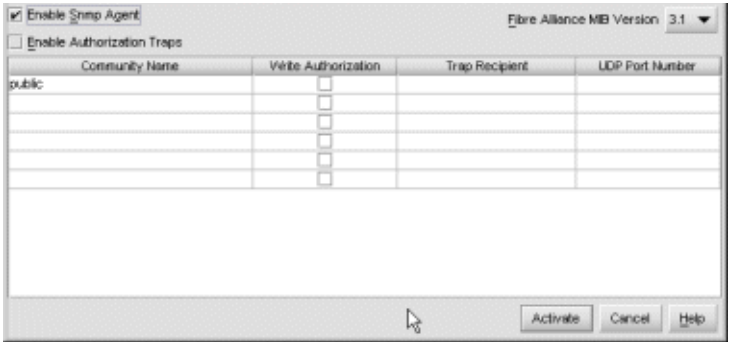


Figure 31 Configure SNMP dialog box

a. For each trap recipient to be configured, enter a community name of 32 or fewer alphanumeric characters in the associated Community Name box. The community name is incorporated in SNMP trap messages to ensure against unauthorized viewing or use.

b. Click the box in the Write Authorization column to enable or disable write authorization for the trap recipient (default is disabled).

A check in the box indicates write authorization is enabled. When the feature is enabled, a management workstation user can change the HAFM appliance's sysContact, sysName, and sysLocation SNMP variables.

c. Enter the IP address or DNS host name of the trap recipient (SNMP management workstation) in the associated Trap Recipient box. Use 64 or fewer alphanumeric characters. HP recommends using the IP address.

d. Enter a decimal user datagram protocol (UDP) port number in the associated UDP Port Number box. (This number is commonly 162.)

2. To enable transmission of trap messages to configured SNMP management workstations, select **Enable Authorization Traps**.

   A check appears in the box when transmission is enabled.

3. Click **Activate** to save the information and close the dialog box.

Configuring and enabling e-mail notification

Use this procedure to configure and enable e-mail addresses and Simple Mail Transfer Protocol (SMTP) server addresses to receive e-mail notification of director (and other managed product) events. The addresses must be configured via HAFM, then enabled.

Use these steps to configure and enable e-mail and SMTP server addresses:

1. At the HAFM main page, select **Monitor > Event Notification > Email**.

The Email Event Notification Setup dialog box appears (Figure 32).

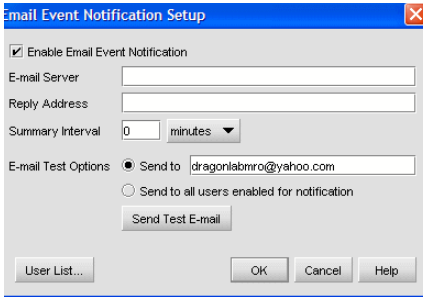


Figure 32 Email Event Notification Setup dialog box

2. To enable e-mail transmission of configured addresses, select **Enable Email Event Notification**. A check appears in the box when transmission is enabled.

NOTE: The enable function must be activated for each director or switch through the Element Manager. E-mail notification can be active for some directors or switches and inactive for others.

3. Enter the IP address or DNS host name of the SMTP server in the E-mail Server box. Use 64 or fewer alphanumeric characters.
4. Enter the e-mail address to which e-mail replies should be sent in the Reply box.
5. At the Summary Interval box, enter the length of time the application should wait between notifications. Select seconds, minutes, or hours from the associated list.
6. To specify users that are to receive e-mail notification, select **User List**.

The HAFM 8.6 Server Users dialog box appears (Figure 33).

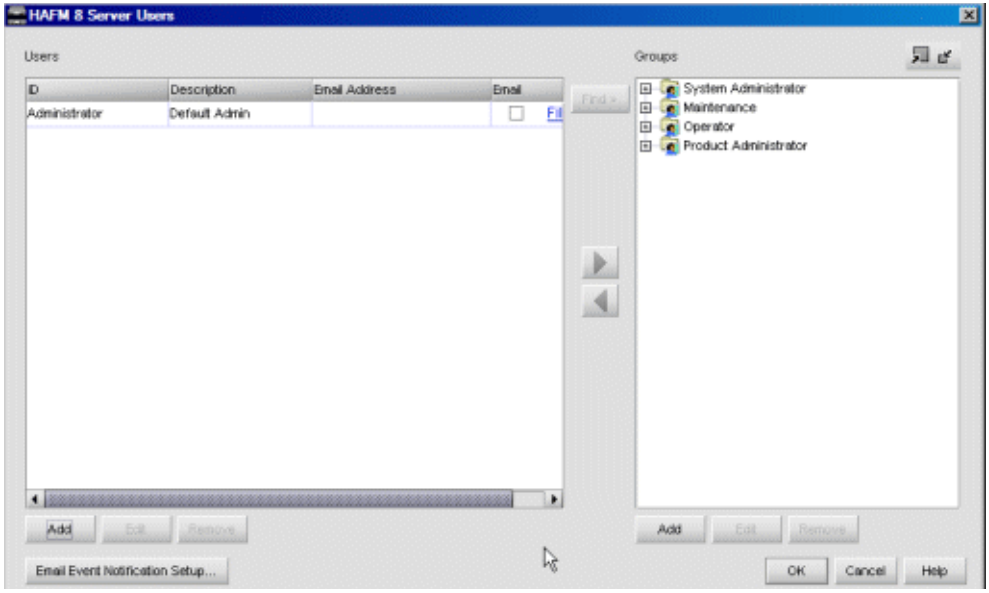


Figure 33 HAFM 8.6 Server Users dialog box

7. To enable e-mail notification for a user, select the box in the Email column.
   An unchecked box indicates e-mail notification is not enabled.
8. To configure event types for which e-mail notification is sent, select the Filter link adjacent to the check box.
   The Define Filter dialog box appears (Figure 34).

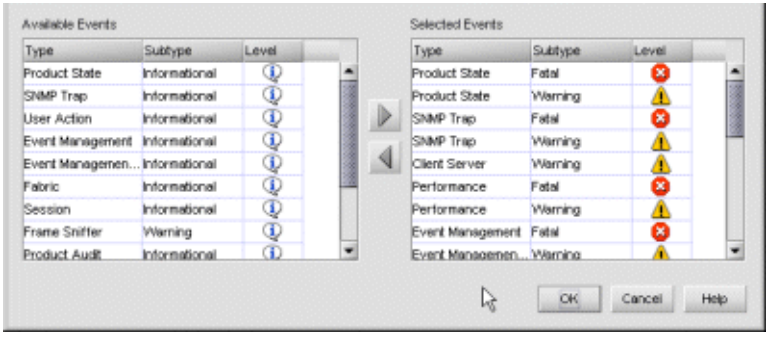


Figure 34 Define Filter dialog box

9. Select the filters that you want for this user.
10. Click **OK** to close the Define Filter dialog box.
11. Click **OK** to close the HAFM 8.6 Server Users dialog box.
12. Select an E-mail test option:
    Send to a user specified in the Send to box
    Send to all users enabled for notification

13. Click **Send Test E-mail**.

    A test message is sent to configured e-mail recipients.
14. Click **OK** to save the information and close the Email Event Notification Setup dialog box.
15. Maximize the Hardware View (Element Manager).
16. At the Hardware View, select **Maintenance > Enable E-Mail Notification**.

    A check appears in the box to indicate e-mail notification for the director is enabled, and the menu closes.

NOTE: Use HAFM to enable or disable e-mail event notification for each director.

Configuring and enabling call-home features

There are two call-home features available, and one is installed with the HAFM application. To learn more about configuring call-home features, refer to the *HP StorageWorks HA-Fabric Manager appliance installation guide*.

Configuring and enabling Ethernet events

Perform this procedure to configure and enable Ethernet events. An Ethernet event is recorded (after a user-specified time interval) when the director-to-HAFM appliance communication link drops. To configure and enable Ethernet events:

1. Select **Monitor > Ethernet Event**.

   The Configure Ethernet Event dialog box appears (Figure 35).

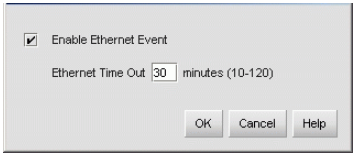


Figure 35 Configure Ethernet Event dialog box

2. Select the **Enable Ethernet Events** box.

   A check appears in the box to indicate Ethernet events are enabled.
3. Enter a value between 10 and 120 minutes in the Ethernet Timeout box.
4. Click **OK** to close the dialog box.

Configuring threshold alerts

Threshold alerts notify you when the transmit (Tx) or receive (Rx) throughput reaches specified values for specific director ports or port types (E_Ports or F_Ports). You are notified of a threshold alert as follows:

- A yellow triangle appears on the port in the Port Card View.
- A yellow triangle appears on the port in the Hardware View.
- A yellow triangle appears in the Alert column of the Port List View.

- A yellow triangle appears by the Threshold Alerts box in the Port Properties dialog box.
- Detailed threshold alert data is recorded in the Threshold Alert Log.

Use the Threshold Alerts option on the Configure menu to configure the following:

- Name for the alert.
- Type of threshold for the alert (Rx, Tx, or either).
- Active or inactive state of the alert.
- Threshold criteria:
  - Percent traffic capacity utilized—The percent of the port's throughput capacity achieved by the measured throughput. This setting constitutes the threshold value. For example, a value of 50 means that the port's threshold is reached when throughput is 50% of capacity.
  - Time interval during which throughput is measured and alert notification can occur.
  - The maximum cumulative time that the throughput percentage threshold can be exceeded during the set time interval before an alert is generated.
- Ports for which you are configuring threshold alerts.

You can configure up to 16 alerts, and any number of alerts can be active at one time. Use the following procedures to create a new threshold alert, or to modify, activate, deactivate, or delete an alert.

Creating new alerts

1. At the Hardware View page, select **Configure > Threshold Alerts**.
   The Configure Threshold Alerts dialog box appears (Figure 36).

NOTE: If alerts are configured, they display in table format showing the name of the alert, type of alert (Rx, Tx, or Rx or Tx), and alert state (inactive or active).

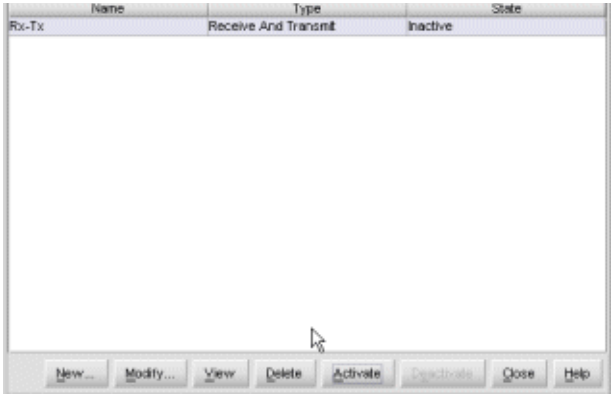


Figure 36 Configure Threshold Alerts dialog box

2. Click **New**.

The New Threshold Alert dialog box appears (Figure 37).

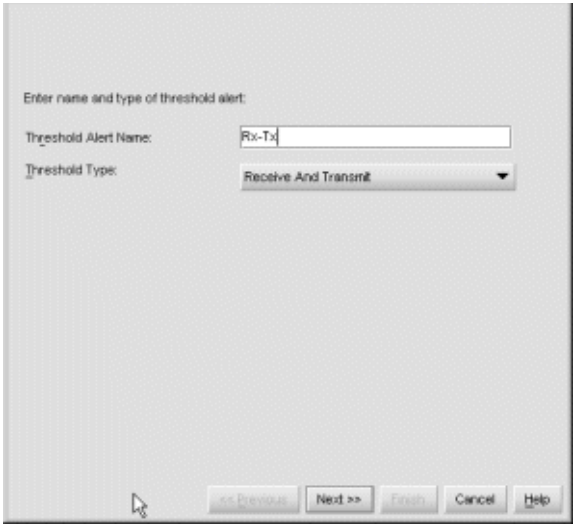


Figure 37 New Threshold Alerts dialog box—first screen

3. Enter a name from one to 64 characters in length. All characters in the ISO Latin-1 character set, excluding control characters, are allowed.
4. Select one of the following from the Threshold Type list:
   - **Receive**—An alert will occur if the threshold set for receive throughput is reached.
   - **Transmit**—An alert will occur if the threshold set for transmit throughput is reached.
   - **Receive or Transmit**—An alert will occur if the threshold set for either receive or transmit throughput is reached.
5. Click **Next**.

   A new screen appears with additional parameters (Figure 38). The name configured for the alert appears at the top of the screen.

NOTE: Click **Previous** if you need to return to the previous screen.

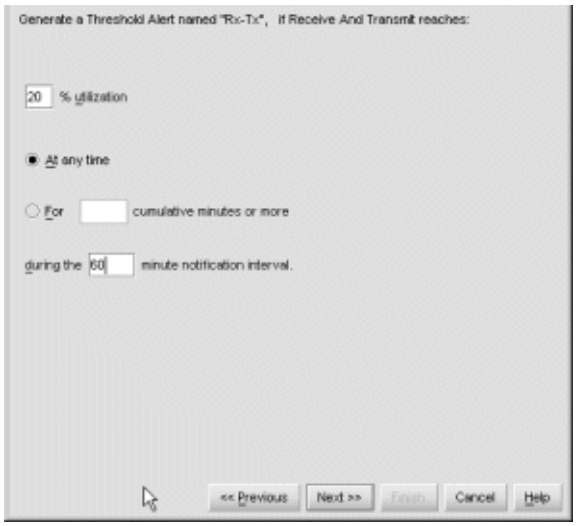


Figure 38 New Threshold Alerts dialog box—second screen

6. Enter a percentage from 1 through 100 for % utilization.

   When throughput reaches this percentage of port capacity, a threshold alert will occur.
7. Enter the amount of cumulative minutes in which the % utilization should exist during the notification interval before an alert is generated. The valid range is from 1 to the interval value set in step 8.

   You can also select At any time if you want an alert to occur whenever the set % utilization is reached.
8. Enter the interval in minutes in which throughput is measured and threshold notifications can occur. The valid range is 5 minutes to 70,560 minutes.
9. Click **Next**.

A new screen appears for selecting ports for the alerts (Figure 39).

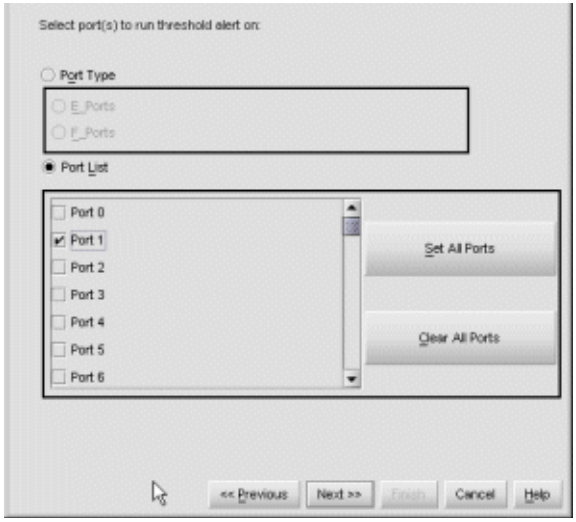


Figure 39 New Threshold Alerts dialog box—third screen

10. Select either **Port Type** or **Port List**.
    - If you select **Port Type**, selecting either E_Ports or F_Ports to cause an alert to generate for all ports configured as E_Ports or F_Ports, respectively.
    - If you select **Port List**, you can specify one or more ports for which to generate an alert:
      - Select individual ports by clicking the port number box
      - Select **Set All Ports**
      - Select **Clear All Ports**
11. Click **Next**.

    A final screen appears to provide a summary of your alert configuration (Figure 40).

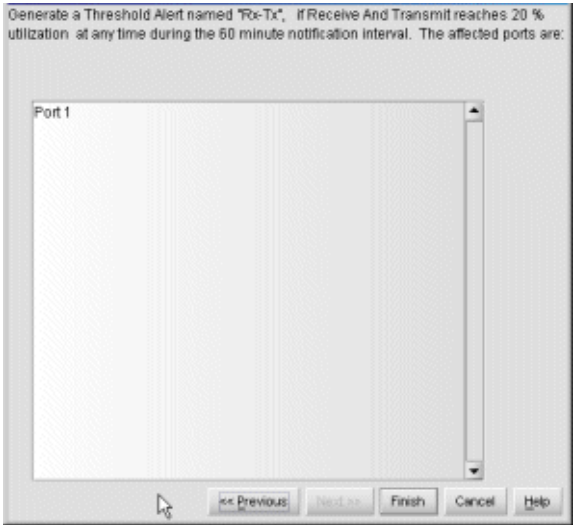


Figure 40 New Threshold Alerts dialog box—summary screen

12. Click **Finish**.

    The Configure Threshold Alerts dialog box appears (Figure 41).

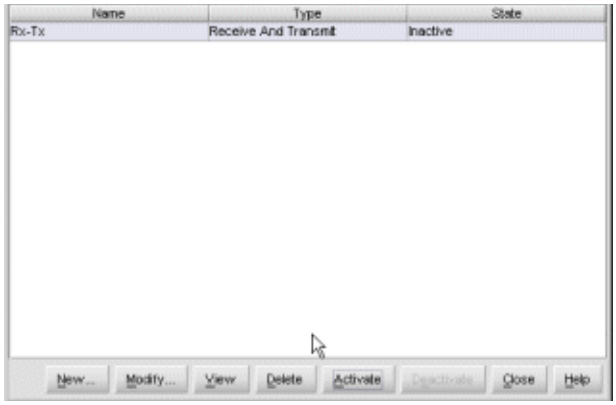


Figure 41 Configure Threshold Alerts dialog box

13. At this point, the alert is not active. To activate the alert, select the alert information that appears in the Configure Threshold Alerts list and then click **Activate**.

    The alert is activated.

Modifying alerts

Use the following steps to modify an existing threshold alert configuration.

1. At the Hardware View page, select **Configure > Threshold Alerts**.

   The Configure Threshold Alerts dialog box appears.
2. Select the alert that you want to modify from the list. If the alert is active, an error message appears prompting you to deactivate the alert.
3. Click **Deactivate** if necessary, and then select the alert information in the table again.
4. Click **Modify**.

   An initial Modify Threshold dialog box appears.
5. Make the appropriate changes to the threshold type.
6. Click **Next**.

   A Modify Threshold dialog box appears, where you can change the % utilization, cumulative minutes for the threshold to occur before notification, and the time interval for measuring throughput and for alert notification.
7. Make the appropriate changes, and then continue through the Modify Threshold dialog boxes. Make changes as necessary, until the summary screen displays the alert configuration.

NOTE: At any time you can click **Previous** or **Next** to display the desired Modify Threshold dialog box and change parameters.

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8. At the summary screen, click **Finish**.

Activating or deactivating alerts

Use the following steps to activate or deactivate existing threshold alerts. In the active state, notifications are generated for the alert. In the inactive state, notifications do not occur.

1. At the Hardware View page, select **Configure > Threshold Alerts**.
   The Configure Threshold Alerts dialog box appears.
   The port's current state, inactive or active, is listed under the State column.
2. Select the alert that you want to change from the list.
3. If the alert is active, select **Deactivate** to change to the inactive state.
   If the alert is inactive, select **Activate** to change to the active state.

Deleting alerts

Use the following steps to delete existing threshold alerts.

1. At the Hardware View page, select **Configure > Threshold Alerts**.
   The Configure Threshold Alerts dialog box appears.
2. Select the alert that you want to delete from the list.
3. Click **Delete**.
   A message appears asking you to confirm the deletion.
4. Click **Yes**.
   The alert is removed from the dialog box.

Configuring SANtegrity Authentication

Use this optional feature to configure the authentication security settings.

NOTE: You must have Administrator privileges to access the SANtegrity Authentication dialog box.

From the Element Manager window, select **Configure Menu > SANTegrity Authentication**.

The Configure SANtegrity Authentication dialog box appears (Figure 42) with the following tabs:

- **Users**—Allows you to setup users who access the switch from CLI and web interfaces.
- **Software**—Allows you to setup software applications that communicate with the switch through API, as well as OSMS authentication.
- **Devices**—Allows you to set device-to-device authentication parameters. The Device tab is PFE key enabled. If a proper PFE key is not provided, the Devices tab is not accessible.
- **IP Access Control**—Allows you to setup IP addresses that can manage the switch.

- **Radius Servers**—Allows you to set Radius server parameters that the switch uses to communicate the authentication information to the designated Radius servers.

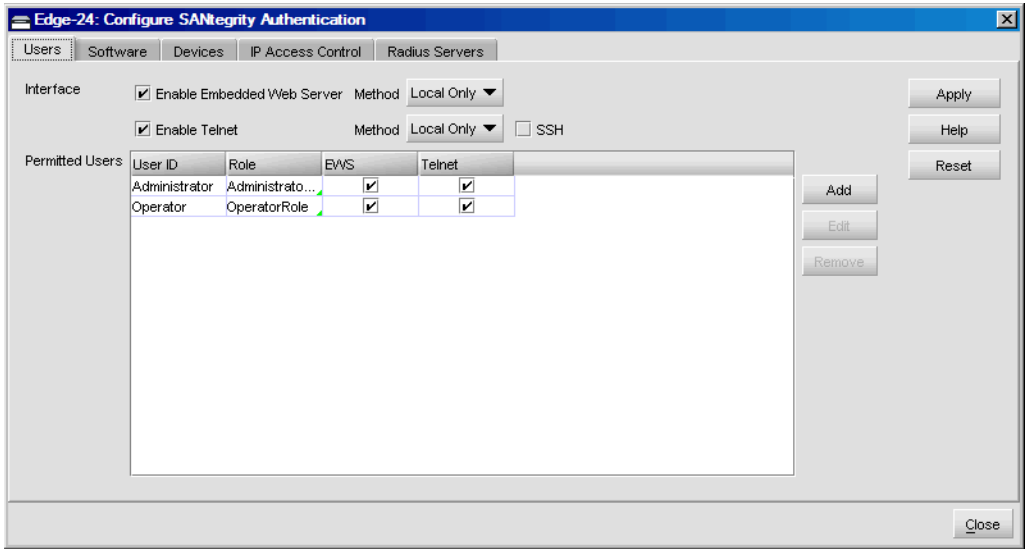


Figure 42 Configure SANtegrity Authentication dialog box

Backing up HAFM configuration data

It is important to back up the HAFM configuration data. This data is used to restore the HAFM appliance operating environment in case of hard drive failure.

Refer to the *HP StorageWorks HA-Fabric Manager Appliance installation guide* for instructions on backing up the HAFM configuration data.

Configuring Open Systems Management Server

For complete procedures on configuring this optional feature, refer to the *HP StorageWorks Director Element Manager user guide*.

Configuring FICON Management Server

For complete procedures on configuring this optional feature, refer to the *HP StorageWorks Director Element Manager user guide*.

Configuring feature key

For complete procedures on configuring this feature, refer to the *HP StorageWorks Director Element Manager user guide*.

Configuring Open Trunking

This option is only available if the Open Trunking feature is installed. For details on Open Trunking and configuring parameters such as congestion thresholds for ports, event notification options, and low BB credit threshold, refer to the *HP StorageWorks Director Element Manager user guide*.

Enabling Embedded Web Server

Use the following steps to enable EWS:

1. At the Hardware View page, select **Configure > Enable Web Server**.
   Selecting Enable Web Server automatically places a check in the box.
2. Select **Enable Web Server** again to remove the check and disable the EWS interface.
   When disabled, remote users cannot access the interface.

For complete procedures on using EWS, refer to the *HP StorageWorks Embedded Web Server user guide*.

Enabling Telnet

Use the following steps to enable Telnet:

1. At the Hardware View, select **Configure > Enable Telnet**.
   Selecting Enable Telnet automatically places a check in the box.
2. Select **Enable Telnet** again to remove the check and disable telnet access.
   When disabled, remote users cannot access the director through telnet.

Connecting cables to the Fibre Channel ports

Use these steps to connect Fibre Channel port cables:

1. Route the fiber-optic cables from customer-specified devices to ports at the front of the director.
2. Bundle Fibre Channel cables from the director and other equipment (groups of 16 maximum), and secure them as directed by the customer.
3. Set the director online. For instructions, see "Setting the director online" on page 50.

Connecting the director to a fabric

To attach the director to a multi-switch fabric, connect the director to an E_Port of another director or switch. The E_Port to E_Port connection is referred to as an ISL.

Use these steps to fabric-attach the director and create an ISL:

1. Verify that the director is defined via HAFM. See "Enabling HAFM to manage the director" on page 46.
2. Verify that the preferred domain ID for the director is unique and does not conflict with the ID of another director or switch participating in the fabric. To change the domain ID, see "Configuring fabric parameters" on page 55.
3. Verify that the R_A_TOV and E_D_TOV values for the director are identical to the values for all directors and edge switches participating in the fabric.
4. Route a multi-mode or single-mode fiber-optic cable (depending on the ISL distance between directors) between customer-specified E_Ports on both directors.
5. At the HAFM application physical map, right-click the director product icon, and then select **Element Manager** from the menu.
6. If required, click the **Hardware** tab.

The Hardware View appears.

7. Double-click the graphical port connector used for the fabric ISL. The Port Properties dialog box appears (Figure 43).

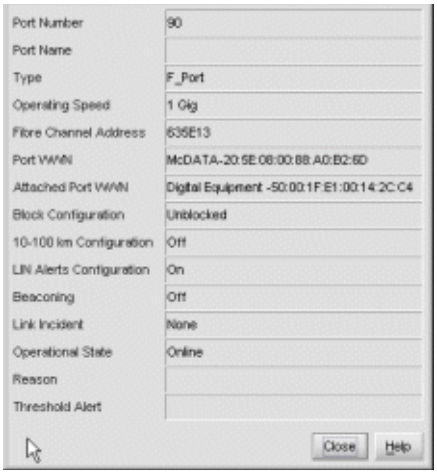


Figure 43 Port Properties dialog box

8. Verify that the Link Incident box displays `None`.

   If an ISL segmentation or other problem is indicated, consult the *HP StorageWorks Director 2/140 service manual* to isolate the problem. If no problems are indicated, installation is complete.

Unpacking, inspecting, and installing the Ethernet hub (optional)

The HAFM appliance and one or more directors connect through an Ethernet hub installed on a 10/100 Mbps LAN segment. One hub port is required to connect the HAFM appliance, and one hub port is required to connect each director. A combination of up to 48 HP directors or switches can be configured and managed by a single HAFM appliance, therefore multiple hubs may be required to provide sufficient port connections. These hubs must be connected in accordance with the hub manufacturer's specifications. HP recommends using a star or hub-and-spoke topology when connecting multiple hubs. The HAFM appliance must be connected to the center hub, and there should never be more than two hubs between the HAFM appliance and any director. Refer to the hub manufacturer's documentation for more detailed information.

For instructions to unpack and inspect one or more Ethernet hubs, and to install the hubs in a desktop or rack-mount configuration, refer to the appropriate Ethernet hub documentation.

Using HAFM from a remote location

You can use a standard Web browser to download and install the client HAFM and Director Element Manager on PCs or workstations that are LAN-attached to the HAFM appliance. Operators at these platforms can manage and monitor directors or switches controlled by the appliance. A maximum of 25 concurrent users can log in to the HAFM appliance.

Each client must have access to the LAN segment on which the HAFM appliance is installed. Director administrative functions are accessed through the LAN and appliance. Use this section to install the HAFM client on a remote workstation.

Remote workstation minimum requirements

The Client HAFM and Element Manager applications operate on platforms that meet the following minimum system requirements:

- Desktop or notebook PC with color monitor, keyboard, and mouse, using an Intel Pentium III processor with a 700 MHz or greater clock speed, and using the Microsoft Windows 2000 (with service pack 5 or higher), Windows NT 4.0 (with service pack 6a), or Windows 2003 operating system.

NOTE: In order for HAFM to function properly, compatible versions must be installed on both the client and server machines.

- UNIX® Workstation with color monitor, keyboard, and mouse using:
  - Linux-based system using an Intel Pentium III processor with a 1 gigahertz (GHz) or greater clock speed, using the Red Hat® 7.3 or higher operating system.
  - HP PA-RISC processor with a 400 MHz or greater clock speed, using the HP-UX 11 or higher operating system.
  - Sun Microsystems® UltraPARC-II processor with a 300 MHz or greater clock speed, using the Solaris Version 7.0 or higher operating system.
  - IBM POWER3-II® microprocessor with a 333 MHz or greater clock speed, using the AIX Version 4.3.3 or higher operating system.
- At least 150 MB (Windows-based) or 350 MB (UNIX-based) available on the internal hard drive.
- 512 MB or greater RAM.
- Video card supporting 256 colors at 800 x 600 pixel resolution.
- Ethernet network adapter.
- Java-enabled Internet browser, such as Microsoft Internet Explorer (Version 4.0 or later) or Netscape Navigator (Version 4.6 or later).

Installing HAFM client on a remote workstation

Use these steps to install HAFM on a remote client:

1. Verify the workstation and the Ethernet LAN segment (with the director attached) are connected through the Internet.
2. At the workstation, launch the browser application.
3. At the browser, enter the HAFM appliance IP address.
4. The HAFM splash screen appears (Figure 44), with the following options.
   a. **Install HAFM remote client application**—Select this option to install the application for your workstation platform. Advance to step 5.

b. **Download SNMP MIB files**—The Management Information Base (MIB) files are provided in standard ASN.1 syntax and may be installed into the MIB database of any SNMPv2 compliant Network Management Station.

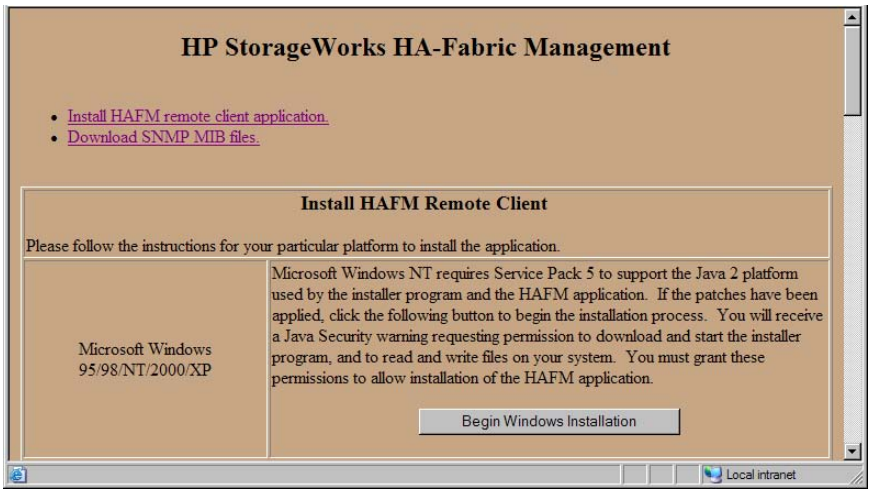


Figure 44 HAFM remote client install

5. If you selected Install HAFM remote client application, follow the instructions provided that pertains to your platform.
6. After you have downloaded the installer executable, the InstallAnywhere Wizard appears. Follow the instructions provided to continue the installation.

Launching HAFM from the remote client

Use these steps to launch HAFM from a remote client:

1. Double-click the HAFM icon to launch HAFM.
   The HAFM 8.6 Log In dialog box appears (Figure 45).

NOTE: The default Windows 2000 user name is Administrator and the default password is password. The user name and password are case-sensitive.

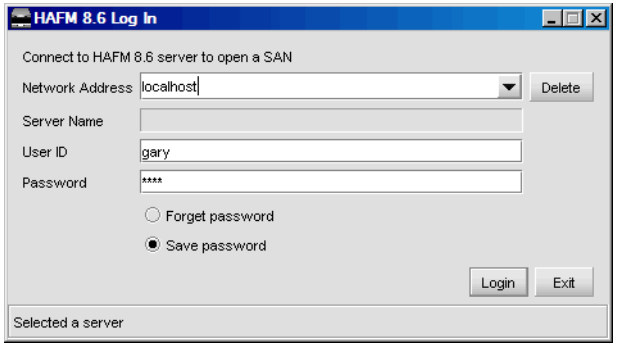


Figure 45 HAFM 8.6 Log In dialog box

2. Enter the HAFM appliance IP address in the Network Address box.
   - The default address that appears in the Network Address box is the address of the last server accessed.
   - Click the Network Address arrow to see a list of network addresses of all HAFM appliances that were accessed from your computer.
   - If you are logging in to the local HAFM appliance, the HAFM appliance name is *localhost.*
   - If you want to connect to an HAFM appliance that is not listed, enter the IP address in the Network Address box.
3. Enter your user name and password in the User Name and Password boxes.

   User names and passwords are case-sensitive.
4. If you want your computer to save the login information, select the **Save password** option.
5. Click **Login**.

The View All - HAFM 8.6 window appears (Figure 46).

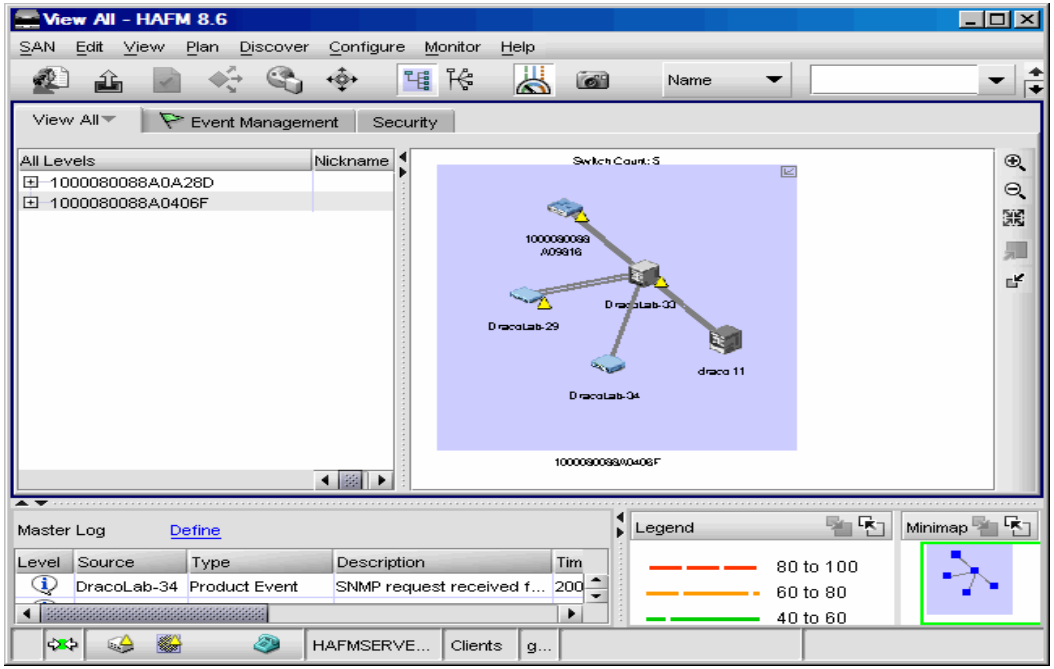


Figure 46 View All - HAFM 8.6 window

3 Managing firmware versions

The director 2/140 internal operating code is downloaded from the HAFM appliance and stored on a CTP card. Up to eight (8) versions can be stored on the HAFM appliance hard drive and made available for download to a director. This chapter contains information on the following firmware management tasks:

- Determining a director firmware version, page 79
- Adding a firmware version, page 80
- Modifying a firmware version description, page 81
- Deleting a firmware version, page 82
- Downloading a firmware version to a director, page 82
- Backing up the director's configuration, page 84

Determining a director firmware version

Use these steps to determine the director firmware version:

1. Open the HAFM application.
   The View All - HAFM 8.6 main window appears.
2. Double-click the icon representing the director to be inspected for firmware version.
   The Hardware View page for the selected director appears.
3. Select **Maintenance > Firmware Library**.
   The Director Firmware Library dialog box appears (Figure 47).

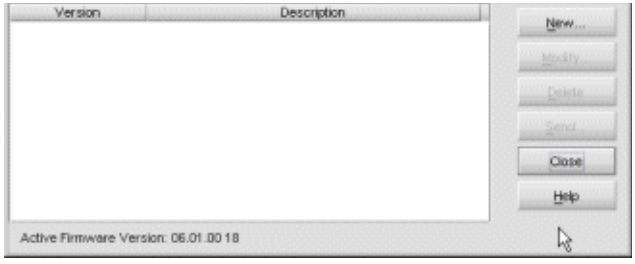


Figure 47 Director Firmware Library dialog box

4. The firmware version appears at the lower left corner of the dialog box in *WW.XX.YY.ZZ* format, where:
   - *WW* is the version level
   - *XX* is the release level
   - *YY* is the patch level
   - *ZZ* is the build level
5. Click **Close**.

Adding a firmware version

The firmware version shipped with the director is provided on the director documentation CD. Subsequent firmware versions to upgrade the director are provided to customers through the HP website.

NOTE: When adding firmware, follow procedural information in the release notes that accompany the firmware version. The release notes provide supplemental information to this procedure.

Use these steps to add a director firmware version to the library stored on the HAFM appliance hard drive:

1. Obtain the new firmware version from the HP website:
   http://www.hp.com/country/us/eng/support.html
   a. Click **Firmware Downloads** in the left panel.
   b. Click the **Director Firmware Version XX.YY.ZZ** entry, where *XX.YY.ZZ* is the version.
      The Windows Save As dialog box appears.
      Verify or correct the directory path specified in the Save in box and the file name specified in the File name box.
   c. Click **Save**.
      The new firmware version is downloaded and saved to the HAFM appliance or PC hard drive.
   d. If the new firmware version was downloaded to a PC (not the HAFM appliance), transfer the firmware version file to the HAFM appliance by backup disk, CD-ROM, or other electronic means.
2. Open the HAFM application.
   The View All - HAFM 8.6 main window appears.
3. Double-click the icon representing the director to which the firmware version will be added.
   The Hardware View page for the selected director appears.
4. Select **Maintenance > Firmware Library**.
   The Director Firmware Library dialog box appears (Figure 47).
5. Click **New**.

The New Firmware Version dialog box appears (Figure 48).

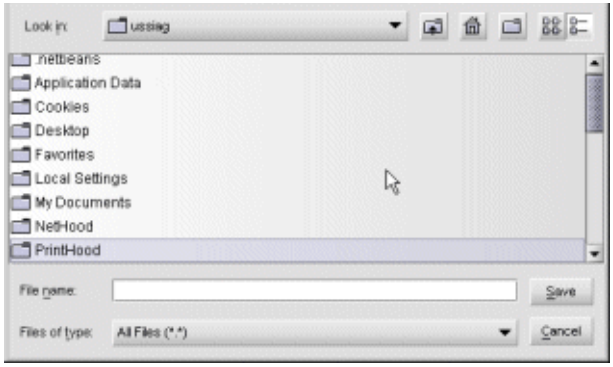


Figure 48 New Firmware Version dialog box

6. Select the desired firmware version file (downloaded in step 1) from the HAFM appliance backup drive, CD-ROM drive, or hard drive.

   Verify that the correct directory path and filename display in the File name box and click **Save**.

   The New Firmware Description dialog box appears (Figure 49).

Figure 49 New Firmware Description dialog box

7. Enter a description (up to 24 characters in length) for the new firmware version and click **OK**.

   HP recommends the description include the installation date and text that uniquely identifies the firmware version.

   A Transfer Complete message box appears indicating the new firmware version is stored on the HAFM appliance hard drive.

8. Click **Close** to close the message box.

   The new firmware version and associated description appear in the Director Firmware Library dialog box.

9. Click **Close**.

10. To send the firmware version to a director, see "Downloading a firmware version to a director" on page 82.

Modifying a firmware version description

Use these steps to modify the description of a director firmware version in the library stored on the HAFM appliance hard drive:

1. Open the HAFM application.

   The View All - HAFM 8.6 main window appears.

2. Double-click the icon representing the director for which the firmware version description will be modified.

   The Hardware View page for the selected director appears.

3. Select **Maintenance > Firmware Library**.
   The Director Firmware Library dialog box appears (Figure 47).
4. Select the firmware version to be modified and click **Modify**.
   The Modify Firmware Description dialog box appears.
5. Enter a modified description (up to 24 characters in length) for the firmware version and click **OK**.
   HP recommends that you include the installation date and text that uniquely identifies the firmware version in the description.
   The new description for the firmware appears in the Director Firmware Library dialog box.
6. Click **Close**.

Deleting a firmware version

Use these steps to delete a firmware version from the library stored on the HAFM appliance hard drive:

1. Open the HAFM application.
   The View All - HAFM 8.6 main window appears.
2. Double-click the icon representing the director from which the firmware version will be deleted.
   The Hardware View page for the selected director appears.
3. Select **Maintenance > Firmware Library**.
   The Director Firmware Library dialog box appears (Figure 47).
4. Select the firmware version to be deleted and click **Delete**.
   A confirmation dialog box appears.
5. Click **OK**.
   The selected firmware version is deleted from the Director Firmware Library dialog box.
6. Click **Close**.

Downloading a firmware version to a director

This procedure downloads a selected firmware version from the HAFM appliance library to a director managed by the open instance of the Element Manager. The procedure applies to a director with two (redundant) CTP cards. The process occurs concurrently without taking the director offline or disrupting operation. The new firmware version takes effect when control is passed from the active to the backup CTP card. Although director operation is not affected, name server, alias server, and login server functions are momentarily unavailable during CTP card switchover. Although traffic is not disrupted, the green port LEDs will flicker or blink during the IPL portion of this operation as control is passed to the other CTP card.

NOTE: When downloading a firmware version, follow procedural information in the release notes that accompany the firmware version. This information supplements information provided in this general procedure.

Use these steps to download a firmware version to a director:

1. Open the HAFM application.

   The View All - HAFM 8.6 main window appears.
2. Before downloading firmware to a director, ensure the required, compatible version of the HAFM application is running on the HAFM appliance. Refer to the release notes that shipped with HAFM.
   a. Select **Help >About**.

      The About dialog box appears and lists the HAFM application version.

      Click **OK** to close the dialog box.
   b. If required, install the correct version of the HAFM application.
3. Double-click the icon representing the director to which the firmware version will be downloaded.

   The Hardware View page for the selected director appears.
4. As a precaution to preserve director configuration information, complete the backup procedure as follows:
   a. Open the HAFM application.

      The View All - HAFM 8.6 main window appears.
   b. Double-click the icon representing the director for which the configuration file will be backed up.

      The Hardware View page for the selected director appears.
   c. Select **Maintenance > Backup & Restore Configuration**.

      The Backup and Restore Configuration dialog box appears (Figure 50).

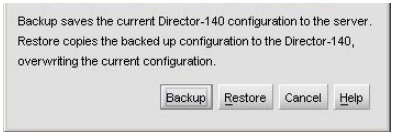


Figure 50 Backup and Restore Configuration dialog box

   d. Click **Backup**.

      When the backup process finishes, the Backup Complete dialog box appears.
   e. Click **OK** to close the dialog box and return to the Hardware View page.
5. Select **Maintenance > Firmware Library**.

   The Director Firmware Library dialog box appears (Figure 47).
6. Select the firmware version to be downloaded and click **Send**.

   The send function verifies existence of certain director conditions before the download process begins. If an error occurs, a message appears indicating the problem must be fixed before firmware is downloaded. Conditions that terminate the process include:
   - A redundant CTP card failure.
   - The firmware version is being installed on the director by another user.
   - The director-to-HAFM appliance link is down.

If a problem occurs and a corresponding message appears, refer to the *HP StorageWorks Director 2/140 service manual* for specific information on isolating the problem. If no error occurs, the Send Firmware confirmation box appears.

7. Click **Yes**.

   The Send Firmware dialog box appears.

   As the download begins, a `Writing data to FLASH` message appears at the top of the dialog box, followed by a `Sending Files` message. This message remains as a progress bar travels across the dialog box to show percent completion of the download. The bar progresses to 50% when the last file is transmitted to the first CTP card. The bar remains at the 50% point until the director performs an Initial Program Load (IPL) (indicated by an `IPLing` message). During the IPL, the director-to-HAFM appliance link drops momentarily and the following occurs at the Element Manager:

   - As the network connection drops, the director Status table turns yellow, the Status box displays No Link, and the State box displays a reason message.
   - The alert panel at the bottom of the navigation control panel displays a gray square, indicating director status is unknown.
   - Illustrated FRUs in the Hardware View page are removed, and then displayed again as the connection is re-established.

   After the IPL, a `Synchronizing CTPs` message appears. This message remains as files are transmitted to the second CTP card and the progress bar travels across the dialog box to 100%. When the download reaches 100%, a `Send firmware complete` message appears.
8. Click **Close** to close the dialog box.
9. Click **Close**.

Backing up the director's configuration

Use these steps to back up the configuration file to the HAFM appliance:

1. Open the HAFM application.

   The View All - HAFM 8.6 main window appears.
2. Double-click the icon representing the director for which the configuration file will be backed up.

   The Hardware View page for the selected director appears.
3. Select **Maintenance > Backup & Restore Configuration**.

   The Backup and Restore Configuration dialog box appears (Figure 50).
4. Click **Backup**.

   When the backup process finishes, the Backup Complete dialog box appears.
5. Click **OK**.

A Regulatory compliance and safety

Regulatory compliance

Federal Communications Commission notice

Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into two classes, A and B, depending upon their intended installation. Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (i.e., personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device as well as additional operating instructions for the user.

The rating label on the device shows which class (A or B) the equipment falls into. Class B devices have an FCC logo or FCC ID on the label. Class A devices do not have an FCC logo or FCC ID on the label. Once the class of the device is determined, refer to the following corresponding statement.

Class A equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

Class B equipment

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit that is different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

Declaration of conformity for products marked with the FCC logo, United States only

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions regarding your product, visit http://www.hp.com.

For questions regarding this FCC declaration, contact us by mail or telephone:

- Hewlett-Packard Company
  P.O. Box 692000, Mailstop 510101
  Houston, Texas 77269-2000
- 1-281-514-3333

To identify this product, refer to the part, Regulatory Model Number, or product number found on the product.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company may void the user's authority to operate the equipment.

Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

Regulatory compliance identification numbers

For the purpose of regulatory compliance certifications and identification, your product has been assigned a unique Regulatory Model Number. The RMN can be found on the product nameplate label, along with all required approval markings and information. When requesting compliance information for this product, always refer to this RMN. The Regulatory Model Number should not be confused with the marketing name or model number of the product.

Laser device

All HP systems equipped with a laser device comply with safety standards, including International Electrotechnical Commission (IEC) 825. With specific regard to the laser, the equipment complies with laser product performance standards set by government agencies as a Class 1 laser product. The product does not emit hazardous light.

Laser safety warning

⚠ **WARNING!** To reduce the risk of exposure to hazardous radiation:

- Do not try to open the laser device enclosure. There are no user-serviceable components inside.
- Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.
- Allow only HP authorized service technicians to repair the laser device.

Certification and classification information

This product contains a laser internal to the fiber optic (FO) transceiver for connection to the Fibre Channel communications port.

In the USA, the FO transceiver is certified as a Class 1 laser product conforming to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR, Subchapter J. A label on the plastic FO transceiver housing indicates the certification.

Outside the USA, the FO transceiver is certified as a Class 1 laser product conforming to the requirements contained in IEC 825-1:1993 and EN 60825-1:1994, including Amendment 11:1996 and Amendment 2:2001.

Laser product label

The optional label in Figure 51 or equivalent may be located on the surface of the HP supplied laser device.

This optional label indicates that the product is classified as a CLASS 1 LASER PRODUCT. This label may appear on the laser device installed in your product.

Figure 51 Class 1 laser product label

International notices and statements

Canadian notice (avis Canadien)

Class A equipment

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Class B equipment

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union notice

Products bearing the CE marking comply with the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community and if this product has telecommunication functionality, the R&TTE Directive (1999/5/EC).

Compliance with these directives implies conformity to the following European Norms (in parentheses are the equivalent international standards and regulations):

- EN55022 (CISPR 22) - Electromagnetic Interference
- EN55024 (IEC61000-4-2, IEC61000-4-3, IEC61000-4- 4, IEC61000-4-5, IEC61000-4-6, IEC61000-4-8, IEC61000-4-11) - Electromagnetic Immunity
- Power Quality:
  - EN61000-3-2 (IEC61000-3-2) - Power Line Harmonics
  - EN61000-3-3 (IEC61000-3-3) - Power Line Flicker
- EN60950 (IEC60950) - Product Safety
- Also approved under UL 60950/CSA C22.2 No. 60950-00, Safety of Information Technology Equipment.

BSMI notice

警告使用者:
這是甲類的資訊產品，在居住的
環境中使用時，可能會造成射頻
干擾，在這種情況下，使用者會
被要求採取某些適當的對策。

Japanese notice

ご使用になっている装置にVCCIマークが付いていましたら、次の説明文をお読み下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

VCCIマークが付いていない場合には、次の点にご注意下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です　この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Korean notices

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약 잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

B급 기기 (가정용 정보통신기기)

이 기기는 가정용으로 전자파적합등록을 한 기기로서 주거지역에서는 물론 모든지역에서 사용할 수 있습니다.

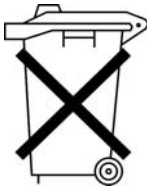
Safety

Battery replacement notice

Your computer is equipped with a lithium manganese dioxide, a vanadium pentoxide, or an alkaline internal battery or battery pack. There is a danger of explosion and risk of personal injury if the battery is incorrectly replaced or mistreated. Replacement is to be done by an HP authorized service provider using the HP spare part designated for this product. For more information about battery replacement or proper disposal, contact an HP authorized reseller or HP authorized service provider.

⚠ **WARNING!** Your computer contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery pack. There is risk of fire and burns if the battery pack is not properly handled. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose to temperatures higher than 60°C.
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.
- Replace only with the HP spare part designated for this product.



Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. To forward them to recycling or proper disposal, please use the public collection system or return them to HP, an authorized HP Partner, or their agents.

For more information about battery replacement or proper disposal, contact an HP authorized reseller or service provider.

Taiwan battery recycling notice

廢電池請回收

The Taiwan EPA requires dry battery manufacturing or importing firms in accordance with Article 15 of the Waste Disposal Act to indicate the recovery marks on the batteries used in sales, giveaway or promotion. Contact a qualified Taiwanese recycler for proper battery disposal.

Power cords

The power cord set must meet the requirements for use in the country where the product was purchased. If the product is to be used in another country, purchase a power cord that is approved for use in that country.

The power cord must be rated for the product and for the voltage and current marked on the product electrical ratings label. The voltage and current rating of the cord should be greater than the voltage and current rating marked on the product. In addition, the diameter of the wire must be a minimum of 1.00 mm^2 or 18 AWG, and the length of the cord must be between 1.8 m (6 ft) and 3.6 m (12 ft). If you have questions about the type of power cord to use, contact an HP authorized service provider.

NOTE: Route power cords so that they will not be walked on and cannot be pinched by items placed upon or against them. Pay particular attention to the plug, electrical outlet, and the point where the cords exit from the product.

Japanese power cord notice

製品には、同梱された電源コードをお使い下さい。
同梱された電源コードは、他の製品では使用出来ません。

Electrostatic discharge

To prevent damage to the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

Preventing electrostatic damage

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly (see "Grounding methods" on page 91).

Grounding methods

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm (±10 percent) resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have an HP authorized reseller install the part.

NOTE: For more information on static electricity, or assistance with product installation, contact your HP authorized reseller.

B Technical specifications

This appendix contains the following information:

- Physical dimensions, page 93
- Environmental specifications, page 93
- Power requirements, page 94
- Operating tolerances, page 94
- Laser information, page 95

Physical dimensions

Table 4 lists Director 2/140 dimensions.

Table 4 Dimensions

Dimension	Size
Height	52.7 cm (20.9 in)
Width	44.1 cm (17.5 in)
Depth	61.0 cm (24.2 in)
Weight	75.9 kg (167 lb)
Shipping Weight	102.1 kg (225 lb)

Environmental specifications

Table 5 lists environmental ranges for shipping, storing, and operating the HP StorageWorks Director 2/140.

Table 5 Environmental specifications

Specification	Shipping	Storage	Operating
Weight	102.1 kg (225 lb)	75.9 kg (167 lb)	75.9 kg (167 lb)
Temperature	–40°F to 140°F (40°C to 60 °C)	34°F to 140°F (1°C to 60 °C)	40°F to 104°F (4°C to 40 °C)
Humidity	5% to 100%	5% to 80%	8% to 80%
Maximum wet-bulb temperature	84°F (29°C)	84°F (29°C)	81°F (27°C)
Altitude	40,000 ft (12,192 km)	40,000 ft (12,192 km)	10,000 ft (3,048 km)

Power requirements

Table 6 lists Director 2/140 power requirements.

Table 6 Power requirements

Specification	Value
Input voltage	180 to 264 VAC
Input current	4.66 amps at 180 VAC
Input power	842 watts
Input frequency	47/63 Hz

Operating tolerances

Table 7 lists heating and cooling specifications, shock and vibration tolerances, acoustical noise, and inclination.

Table 7 Operating tolerances

Specification	Value
Heat dissipation	842W (2,873 BTU/hr)
Cooling airflow clearances	Right and left sides: 2.5 cm (1.0 in) Front and rear: 7.6 cm (3.0 in) Top and bottom: No clearance required
Shock and vibration tolerance	60 Gs for 10 milliseconds without nonrecoverable errors
Acoustical noise	7.0 Bels “A” scale
Inclination	10° maximum

Laser information

Three configurations of cards with fixed optics will be provided for each of the connector types: four extended long-wave ports, four long-wave ports, and four short-wave ports. Table 8 lists the 2 Gb laser specifications.

Table 8 Laser specs - 2 Gb

Part number	Transceivers on UPM card	Wave length	Media/distance	Standard
300836-B21 Long wave - 35 Km	4 Extended Long wave	1310 nm	9/125 µm Single-mode: 1 m–35 Km	100-SM-LL-L
300835-B21 Long wave - 10 Km	4 Long wave	1310 nm	9/125 µm Single-mode: 1 m–10 Km	100-SM-LL-L
300834-B21 Short wave	4 Short wave	850 nm	50/125 µm Multi-mode: 2 m–500 m 62.5/125 µm Multi-mode: 1 m–200 m	100-M5-SN-I

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